FOOD MANUFACTURE

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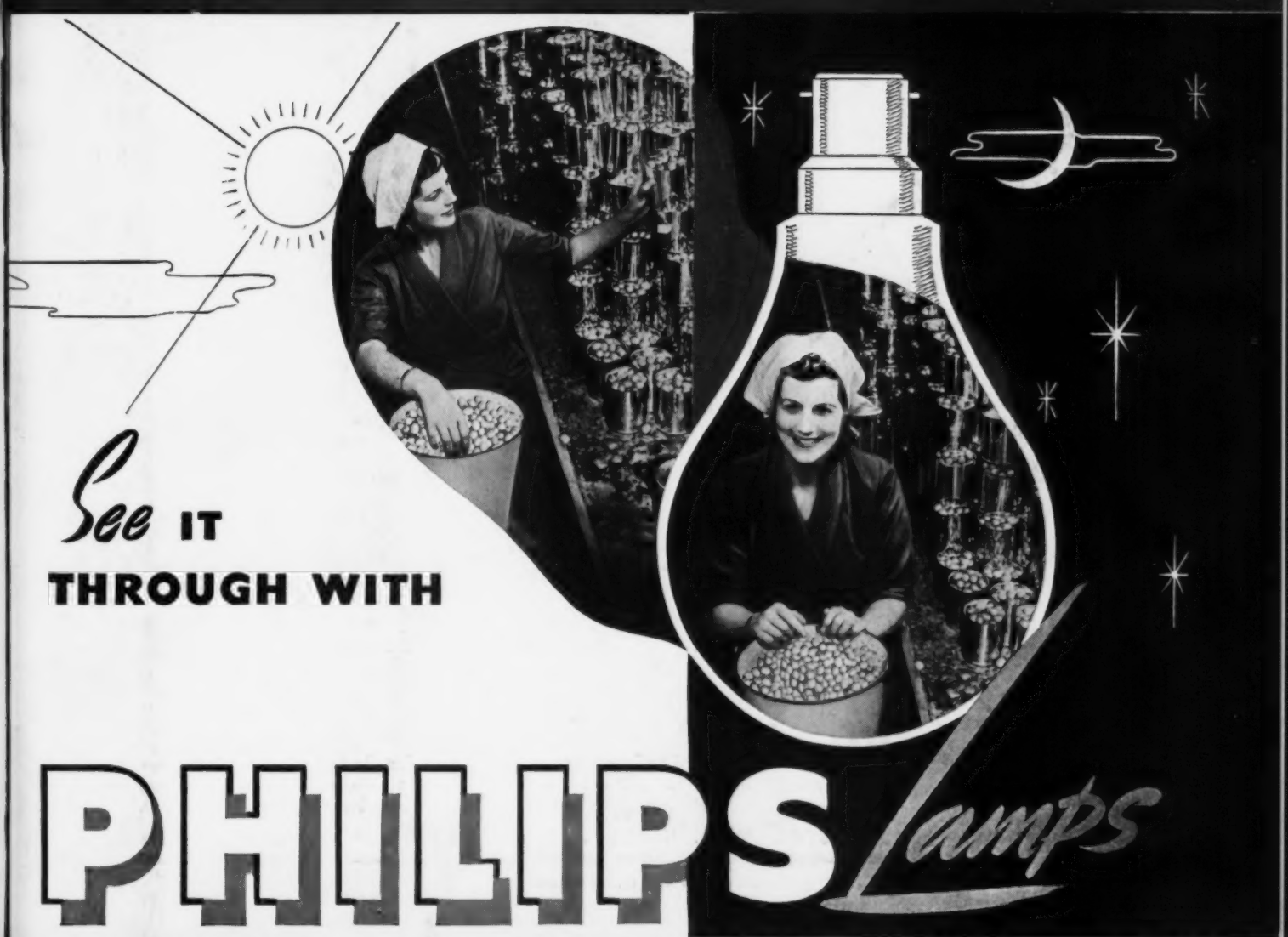

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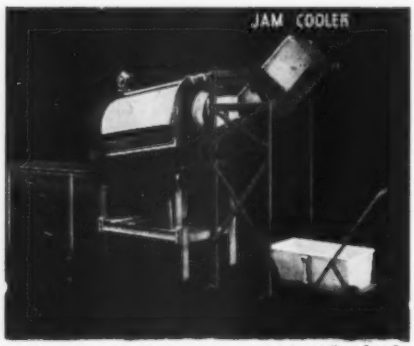
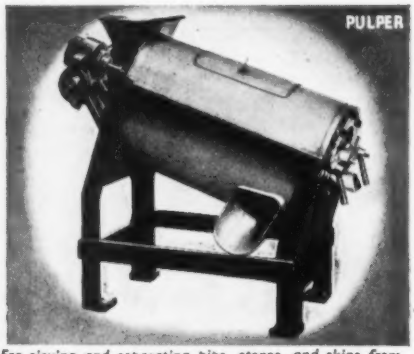
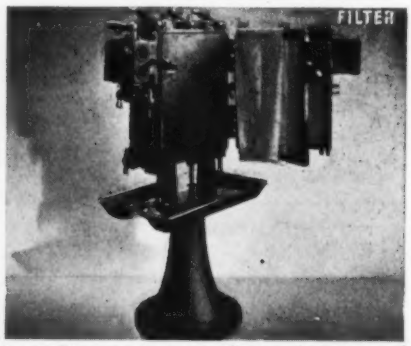


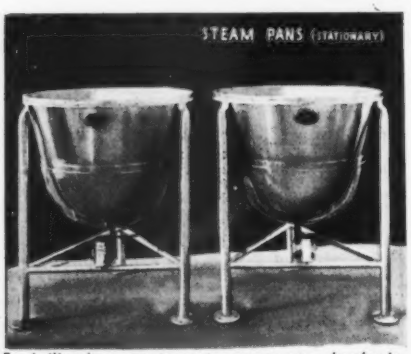
Speeds up output. Cools continuously and rapidly. **Leaflet 200.**



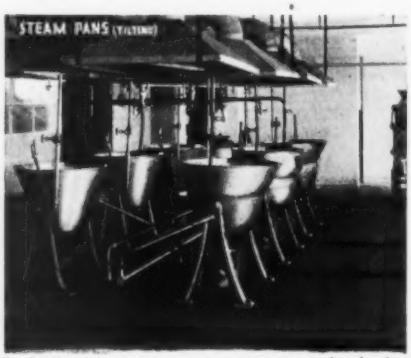
For sieving and separating pips, stones, and skins from fruits and vegetables. **Leaflet 177.**



For the filtration of milk, clarification of gelatines and similar purposes. **Leaflet 184.**

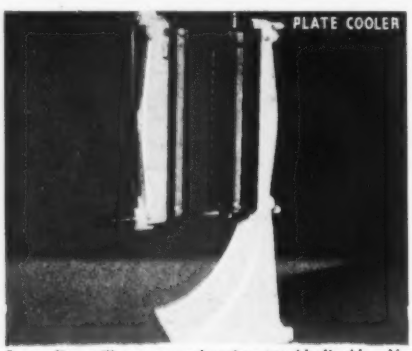


For boiling jams, meats, soups, sauces, etc. In aluminium, stainless steel, nickel and monel, for various steam pressures. Smooth welded interiors. **Leaflet 107.**

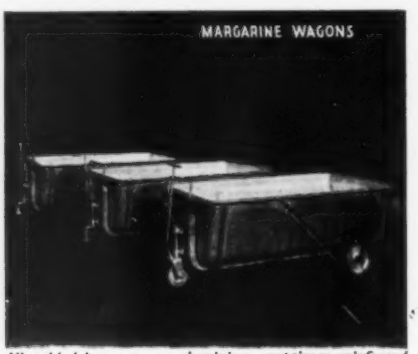


For boiling jams, meats, soups, sauces, etc. In aluminium, stainless steel, nickel and monel, for various steam pressures. Smooth welded interiors. **Leaflet 107.**

Legs and framework of cast aluminium. Top of steel plates covered with stainless steel or nickel. Extremely handsome and robust. **Leaflet 151.**



For cooling milk, sauces and various potable liquids. No moving parts. All surfaces in contact with liquids can be quickly exposed for cleaning. **Leaflet 185.**



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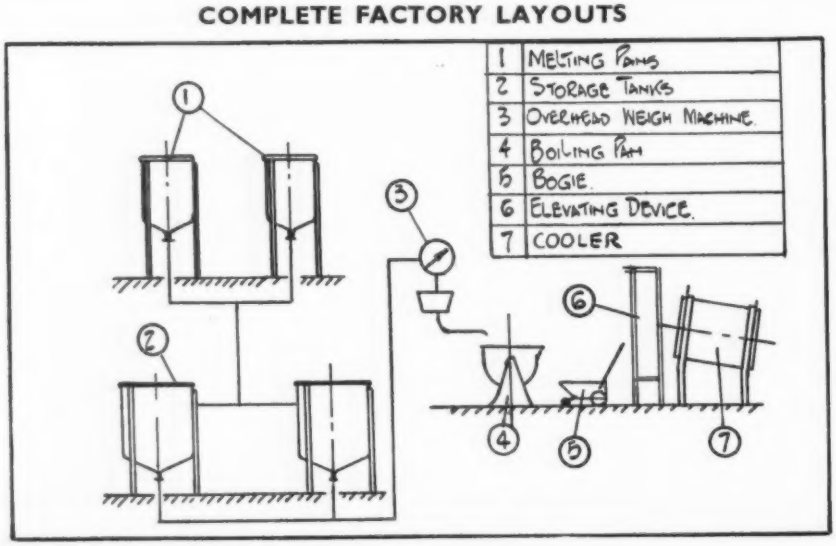

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Facing first page of Editorial

FOOD MANUFACTURE

Vol. XVI, No. 12 December 1, 1941

Point Rations

THE EXTENSION of rationing by the point system which comes into effect to-day will no longer be news by the time these notes are in print. Tinned meat, fish and beans are involved, while pastes, soups, vegetables other than beans, and fruit are to be exempted.

There has been little but praise for the idea of distributing tinned foods in this way, except perhaps from certain sections of the butchery and fishmongery trades. The qualification to handle tinned meat and fish is to have handled it before the war. There are butchers and fishmongers who did this but many others who did not. There are two sides to every question, but for our part we cannot join in the expressions of sympathy of one esteemed contemporary for "the hard-hit butchers and fishmongers who have to stand aside and see the product of the slaughter-house and the fisherman's net passed over the counters of members of another trade which has a multiplicity of lines already". Surely tinned goods of every description have always been mainly handled by the grocers—who are also, in common with most people, also hard-hit. The problem "Who shall sell what?" is an old one, but even in a multiple store tinned goods are not found in the butchery department.

Activated Carbons in the Refining of Sugar

At the meeting of the Sugar Division of the American Chemical Society, E. W. Harris presented a paper on activated carbon for use in the refining of sugar.

Activated carbons, as we know them to-day, are vastly different from the decolorising charcoals employed in the beginning of the eighteenth century in Europe. Much research has been done during the past decade, with the result that activated carbons having high efficiency are employed almost universally in the refining of sugar.

While activated carbons are employed extensively in many fields other than sugar refining, this paper is confined primarily to their use in the sugar industry. In the processing of beet, cane and corn sugar syrups, the requirements of an activated carbon are much the same.

In the manufacture of activated carbons, a wide variety of raw materials is used, and the processing so controlled as to give them the necessary properties for the adsorption of objectionable impurities in sugar syrups.

The refining value of an activated carbon is not necessarily determined by its ability to remove colour, but by its capacity to adsorb colloids and other impurities, many of which are colourless. In the application of activated carbon in refining, a two- and three-stage counter-current method is employed, thereby reducing to a minimum the amount of carbon needed.

Activated carbons are selective in their power to adsorb impurities from solutions, and it has been found that they will remove molasses-forming compounds from sugar syrups. This is of great importance because of its effect on crystallisation. Such impurities not only retard the rate of crystallisation, impair the character of the crystal, but reduce the yield of crystallisable materials. These molasses-forming impurities are largely organic materials and therefore are readily adsorbed by the carbon.

River Pollution Control

The Lancashire Ribble, which some ten years ago was so polluted that it was hardly worth fishing and salmon netters were earning a precarious living, has been restored to a natural breeding water, yielding 5 tons of salmon per year, by the Ribble Board of Conservators following a policy of persistent efforts to "continue to fight with unabated zeal for *pure*, as distinct from merely *inoffensive*, rivers" (to quote one of its reports). In the past ten years the Board turned some 146,000 salmon fry from early spring fish into the river, also 851,000 sea-trout fry and over 55,000 brown-trout fry. The estuary of the Severn is probably more polluted than the Thames, but high water takes the salmon up-river, and its tributary, the Wye, yields some 22 tons of salmon annually.

Recent research in river pollution (Dept. of Scientific and Industrial Research Reports) shows that waste water from milk industries and sugar beet can be used again with the aid of a cheap percolating filter which reduces milk waste pollution by 99 per cent., or with the aid of activated sludge process, reducing it by 97 per cent. The death of many Tees smolts migrating to the sea in spring was found to be caused by cyanides from coke-oven effluents, which can be converted into less toxic ferrocyanide with lime and spent pickle liquor. The alteration of the Penrith sewage works the other year considerably improved or removed the pollution problem from the Eden salmon fishery. The use of lime, or in some cases lime and ferric chloride, will encourage settling and sludge formation in screened wastes from tomato, red beet and other canning wastes, the dried sludge being suitable farm manure.

As a war-time food source, our salmon rivers are worth about £3,000,000 annually, with a yield of about 6,000 tons of salmon.

Sweet-potato Flour

Colonies and dependencies in the West Indies and elsewhere having climatic conditions suited to the sweet potato may be interested in the news that a successful process for dehydrating the Porto Rico sweet potato has been developed by the South Carolina Agricultural Experiment Station. The process gives a sweet-potato flour of yellow-orange colour that is palatable, adaptable in recipes as a substitute for the raw vegetable and is capable of indefinite storage without moulding or similar spoilage. It does not cake upon exposure to humid atmospheres. It also has the valuable property—rare amongst starchy foods—of having a high content of provitamin A, averaging about 12,000 micrograms of carotene per hundred grams. Baked goods such as biscuits, muffins, pastry and cake in which from 12 to 22 per cent. of this flour had been incorporated are stated to have contained from 1,400 to nearly 3,400 micrograms of carotene per hundred grams when fresh, and practically as much after three weeks' storage. Costs of production are not available, but the material would seem to be a useful addition to the world's supply of foodstuffs, and its special attributes appear to justify its serious consideration for importation into the United Kingdom during the present crisis from political as well as nutritional viewpoints.

Dietary Yeast and Disease

In 1940 the important discovery was made by D. D. Woods that para-aminobenzoic acid possesses the unique property of antagonising the bacteriostatic activity of the powerful new drug sulphonilamide—*i.e.*, in presence of the acid the ability of the drug to combat bacterial invasion is reduced. He suggested that the acid was present in yeast. Also, last year, the acid was shown by S. D. Rubbo and J. M. Gillespie to be present in yeast, but these workers were not able to find more than an excessively minute amount of it in Australian yeast. Now K. C. Blanchard of Johns Hopkins University has made further study of the aminobenzoic acid content of bakers' yeast (*Biochemical Journal*, vol. 140, 1941, pp. 919-926) and has found a proportion of the acid which, though still small, is many times larger than that revealed by Rubbo and Gillespie. The quantity isolated by Blanchard is of the order of 1 milligram per 300 grams of yeast, and about this proportion was free; there was evidence that about an equal amount more was present in combination, possibly as a peptide. Though the significance of aminobenzoic acid in foods is not yet clear, the demonstration of its presence in yeast suggests that medicinal ingestion of yeast may be contra-indicated in febrile conditions that are being treated by drugs of the sulphonilamide group. It would be interesting to know whether para-aminobenzoic acid exists in brewers' yeast, and, if so, whether it exists also in beer.

Proposed Food Labelling Regulations in U.S.A.

Proposed regulations relating to foods for special dietary uses have been announced by the Federal Security Agency.

The proposed regulations have been drawn up to give effect to Section 403(j) of the Federal Food, Drug and Cosmetic Act, which declares a food misbranded if it is represented as a food for special dietary use and its label does not bear the information required by the regulations. Such information as vitamin, mineral and other dietary properties of food, which would be necessary to fully inform purchasers as to its value for special dietary uses, is required in the proposed regulations.

The proposed regulations if approved will supersede the proposals previously published. "The original proposals," the Federal Security Agency states, "had resulted in considerable misunderstanding, as many food interests gained the impression that the proposed label statements were derogatory in character." It is the view of Agency officials, however, that simple factual statements can be prescribed which will be of great value to the rapidly increasing numbers of consumers interested in dietary matters, and that such statements will not hamper honest and fair sale of food products for special dietary use but will promote confidence in dietary claims to the advantage of both producers and consumers.

Broad Beans and "Favism"

Fresh broad beans are things of the past for this year, but copious supplies of the dried variety to be seen in the shop windows makes news of a quite unpleasant (judging from the account of the symptoms described in the *Lancet*) disease known as "favism". This disease, which affects the red blood cells, has been known for many years to be connected with eating the beans or inhaling the pollen of the flowers, is seen most often in Sardinia, but it also arises in other districts of Italy and in Greece and North Africa. Happily, so far as this country is concerned, it seems to be limited to people with a Mediterranean ancestry, and this is true of the cases reported in the United States.

Observations all confirm the allergic nature of the disease, but the note is chiefly concerned to remind doctors in England of its existence, especially since we have now numbers of people of Mediterranean ancestry labouring among us.

Pre-Vitamin Days

Recently the editor of *The Fertilizer Review* of Washington, D.C., received an unpublished manuscript bearing the title of this note. It was in mimeographed form, and gave the early personal observations of Professor James F. Breazeale, who was for many years biochemist in the Agricultural Experiment Station of the University of Arizona. As early as 1901 Breazeale began to observe that certain substances had unusual growth-stimulating effects on plants. He soon called these substances "growth accessories" and "active organic matter". He readily proved —as we know now with respect to vitamins in human and animal nutrition—that many substances will stimulate growth and vigour even when present in infinitesimal amounts. His observations led him to believe that the nutritional behaviour of animals and plants is fundamentally very similar, and that under natural conditions it is the product of age-long subjection to environmental factors.

Professor Breazeale's remarks suggested the re-reading of a paper by Judge Richard Peters in Volume I of the *Memoirs of the Philadelphia Society for Promoting Agriculture*. This volume was published in 1808, and the paper had been read before the Society on March 8 in that year. Its title is, "On Coarse Flour, Brown Bread, and the Force of Habit, as it relates to Esculents". Judge Peters was a notable character, and participated actively in the programmes of the Society from its foundation in 1785 until his death in 1828. His paper on "Esculents" is particularly interesting at this juncture when dietary problems are met on every side.

Peters constantly preached that rye bread or ship biscuit or any other rough bread was to be preferred to that made fom "superfine Flour". He mentioned that Baron von Steuben, the organiser and inspector-general of the Revolutionary Army in North America, had often told him of the peculiar healthfulness of the Prussian soldiers. Frederick the Great insisted to Steuben that this rude health was in great measure due to the "ammunition bread", which was made from whole grain, ground but unbolted, and passed through hand-sieves only. In this connection the following passage occurs: "The Baron added with his usual *naïveté*, that this bread was only good for the health of soldiers; but gentlemen would prefer being sick [American for *ill*] on better bread."

"Vitamins—the V-Sign": Another American View

Ideas with a punch because expressed in racy language are a speciality of Jeff McDermid, who writes in *Better Crops with Plant Food*, issued by the American Potash Institute, Inc. This is also published in Washington. Jeff's charm is that of the character in the film "Our Town", who appears to come right out of the picture in order to have a heart-to-heart talk with whoever is listening to him. We imagine Jeff as sitting on the porch or maybe on the rails of the old fence while he compares yesteryear with nowadays. Here are some of his remarks: "To many minds vitamins are what you buy at the drug store that you should have got at the grocery. I doubt very much if Osborne or McCollum and their diligent associates back in the rat-ridden days of small funds and much guesswork could have ever anticipated the diversity of satisfaction, employment, relaxation, hope, and health which the vitamin era has set going. Probably no other practical application of pure science has engendered more lines of activity except the invention of the gasoline and Diesel engines. Lots of it has been bum stuff and poor economics maybe, but that much can also be said for motor mechanics and then some more besides.

"It was our lot to be raised in the period just at the turn of the century, before men had become addicted to pre-digested packaged foods and devitalised victuals. I remember when father brought home the original paper

boxes of 'Grainose'. We began eating it as a sort of dessert and had to explain to visitors that we were not dyspeptic or inclined to copy the table customs of Battle Creek sanitariums. Gradually, however, the breakfast table slid over into the hay food category and mothers quit serving us the rich natural fodder of our forefathers. The grocers had to adopt the new methods as the years went by, and bakers refined their breads and pastries to the extreme limits of safety—all being so gradual that few noticed or protested it. Yet I am not so quick to blame the food fads of other days for all the troublesome defects which have since become a national heritage more or less.

"When we can combat ignorance and indifference successfully and give more families a decent margin of income for needful variety in their foods, it will get more vitamins into service. It is also a question worth proposing whether the matter of securing rigid patent rights on certain processing or compounding, so as to restrict the source of vitamins required to registered items and groups is going to hold back the wider use of vitamins by under-privileged persons; and if warfare between commodity interests to prevent fortification of rival fats and oils with vitamin A, for instance, is doing any good to either party, and may work injury to hosts of poor consumers.

". . . But get your vitality at the table and in action, rather than over the prescription desk. It will make the V sign stand for something lasting on this side of the globe, far richer than a military victory for us all."

Fruit Salads and Flannel Shirts

Until recently nobody would have thought of associating the two, but now a use for the papaw has been found which provides a link between textiles and the fruit industry. Papaws, for long appreciated by the "inner man" wherever they were obtainable, are now likely to be appreciated by the "outer man" as well. The tremendous demand for unshrinkable wool for clothing for our fighting men has started studies of every process likely to lead to stopping shrinkage in woollen goods. A lifeline for the wool industry (says the *Queensland Agricultural Journal*) may be provided by two remarkable developments, in both of which there figures an extract of the Queensland papaw. They are an anti-shrinking process and the taking of the "tickle" out of woollens. It is believed that when military requirements cease to be our first consideration these developments will strengthen tremendously the position of wool in the textile world.

The anti-shrinkage process gives the finer wools a greater range of usefulness than they had until now, and also permits woollens to be washed in the same way as cotton garments are. The process (says the same source) is developing amazingly in the manufacture of army clothing, and it will be ready for immediate application to ordinary trade purposes when the war is over. Every week 500,000 pairs of socks for the services are being treated at a cost of only a penny a pair. The process is called the enzyme process, since it depends on enzymes present in the fruit; it gives a silkiness and a softness to woollens such as had never been known before.

The Dangers of Hypothesis

In an address in the Section of Therapeutics and Pharmacology of the Royal Society of Medicine, Dr. R. D. Lawrence handled the subject of fat and carbohydrate metabolism with special reference to diabetes. The subject was treated in its clinical aspect, and with this we have no concern here, but one statement of the lecturer was so strikingly applicable to scientific workers in any field that we feel it might be placed on record for the good of their souls.

Dr. Lawrence said that in medical research, especially in the rapidly progressing subjects of metabolism and chemistry, any guess that was made—or any hypothesis, if that word was preferred—would generally be wrong. The best they could strive to do was to establish a new fact, which as often as not was merely a new interrelationship of two already known phenomena. Any total explanation of any large hypothesis built up around this new fact would almost certainly be proved later to be wrong or only half right. Such imaginative processes were fascinating and inevitable to the enquiring scientific mind, and were integral stepping-stones in research, but it was all too easy to become biassed in favour of one's own hypothesis, to plan a series of experiments to yield confirmatory results, and to harden one's mind against contradictory results and thus perpetuate error. Another great difficulty was the impossibility of reading and digesting all old and new work on the problem. Such width of reading and knowledge seemed possible only to a whole-time worker in a limited field.

For his own part, working in a field in which error was almost inevitable, he had at least tried to guard himself against two tempting "crimes" in clinical research: (1) the premature publication of improperly controlled and half-proved facts which it might take a whole generation to disprove; and (2) building up wide generalisations and hypotheses, even on true evidence, which were bound to lead others astray for a long time.

Arsenic—Antidote to Selenium

Arsenic has been found to be an effective antidote to selenium poisoning when selenium has been ingested from fodder consisting of selenium-bearing plants in South Dakota. The remedy is not merely of "stunt" interest, for the area of selenium-bearing land in North America is considerable and extends on both sides of the Canadian-United States border. Work on the preventive action of arsenic in selenium poisoning has been conducted on white rats and on dogs in the laboratory and then on swine and range cattle. Arsenic supplied at the rate of 5 parts per million in the drinking water has successfully prevented the toxic effects of 12 parts per million of selenium in the rations for rats, dogs and pigs. This seems to be adequate protection, for the amount of selenium in grain does not often exceed 1 part per million and only rarely exceeds 5 parts per million in fodders. One dog has been kept continuously on a diet containing 12 p.p.m. of selenium and 5 p.p.m. of arsenic in the drinking water for twenty months, and has shown no ill-effects from either element. Litter mates of this dog, kept on the same diet without arsenic, were all dead within five months. Sodium arsenate and arsenite were equally effective as sources of arsenic.

Diets containing much protein in the form of casein have also been found able to counteract the toxic effects of selenium.

How High is an Egg?

Eggs are topical, and not so long ago bad eggs were topical, too, but the badness of an egg could not be expressed in figures. Recent studies made in the Home Economics Section of the Colorado Agricultural Experiment Station have added to our knowledge about the usability of low-quality eggs, and have shown that great differences exist in the quality of newly laid eggs from different hens; the eggs from different hens also vary considerably in their rates of deterioration during keeping. By selection of low-quality eggs on the basis of physical measurements and by using the eggs in the preparation of sponge cakes, it was found that such eggs yield cakes at 5,000 feet altitude that are comparable in all objective tests with similar cakes baked with high-quality eggs at a height of 9,000 feet. (It may be mentioned that no aeroplanes were converted into kitchens for these tests, since a great part of Colorado lies above 6,000 feet.) This means that the strength of the cake structure yielded by the low-quality eggs was only 52 per cent. of that obtained when best-quality eggs were used. It is added that these observations should find application in the frozen egg industry.

"Despite inconveniences, some minor breaks with tradition, some petty annoyances, the nation's food is still delivered in adequate packing."

FOOD PACKAGING TODAY

R. L. ROWNEY

THE fundamental of all policy in war-time is to discard the superfluous and retain only the essential. It is a policy which produces some serious problems in its application, and by no means the least of these is the problem of definition. Tanks are essential and lace is not. But is tobacco more necessary than whiskey? Or are silk stockings more necessary than shoes for evening wear? In considering the influences working on the food-packing industry during 1941, it has to be borne in mind that the criterion of "necessity" has not been a simple automatic directing control. The authorities have not found their job easy, to restrict supplies over so wide a range with the relative degrees of stringency which national policy dictates.

Some Determining Factors

The operation of certain determining factors outside the direct control of supplies of the raw materials for packing are plain enough. The rationing of foods has placed a very definite limit on the volume of packaging supplies needed for a fixed list. But if this list of foods like butter and cheese and tea is obvious, it is no less apparent that there has been an even greater restriction in other, technically unrationed, commodities, where the restricting influence is not the ration book but the absolute shortage of supplies. It is estimated that the volume of packed foods of this type reaching the final consumer has been reduced by a third in general and by an even larger percentage in specific cases.

Against this, of course, there must be set the twin demands of foodstuffs for the Forces and for national stocking. Later on we have something to say about the variation in the type of packing that this has implied. Here, it is to be noticed that it rules out any generalisation as to the scope of the packing industry's activity which might be deduced from the limitation of civil supplies. The statistical blackout makes it impossible to assess the bulk of packing for national uses, but the recent speeches of Lord Woolton have made it plain that what the industry has, perforce, lost on the swings it has recovered on the roundabouts. This, too, is the evidence provided by the accounts of companies like United Glass Bottle, whose total profits rose from £456,050 to £537,770 in 1940, and, particularly, by the showing of organisations like Metal Closures, National Canning and Transparent Paper, all of which are concerned with the use of materials high up on the schedule of priorities, and which all managed to maintain, and more than maintain, their profits.

The deduction here is that the operations of the food packing industry have been actually on an increased scale despite the very substantial reduction in the effective demand from the civilian population.

Changes in Types of Packing

The changes in the types of packing have been determined by various factors. In the first place, there is the question of economy, which in its simplest aspect means that where one square yard of paper was used before, only half as much may be used now, or that where paper of a certain quality was used a cheaper type is employed, but which also means the substitution of paper for cardboard, of cardboard for metal.

Secondly, there is the question of bulk. With so great a part of the packing industry's attention turned from the private consumer to the national hoard, or to the military camp, so the individual package has become very much larger, and has changed its substance. Tea that was supplied to Mr. Brown in a paper package containing a quarter of a pound is supplied instead to a camp of Private Browns in a 3-ply case containing very many pounds. Cheese that was delicately fastened in a few square inches of silver foil for the delectation of Mrs. Smith

Pre-war Prestige Pack.

is packed instead in time-resisting matter for the future day when Mrs. Smith will have become a unit in a population engaged in defeating invasion.

No "Luxury" Packing

In matters affecting the nation's well-being, the schedule of priorities comes into operation to ensure that needful supplies will in any case be available. So that in that part of the packing industry's activity which has been turned to the service of a nation at war, the question of supply difficulties has scarcely arisen. If metal has been required, it has been found, or if timber or paper was wanted it was not lacking. (Glass, which is so much more a "native" product so far as sources of supply are concerned, is dealt with later.) But the authorities have had no time for pandering to prejudices in the matter of ordinary supplies to the public. Many dry foods previously packed have been delivered to shopkeepers loose, and the shopkeepers have required their customers to take away their purchases in packages of their own device. The principle on which the Board of Trade has acted is that foodstuffs should be packed so as to enable them to be efficiently handled without fear of the destruction of the package, that they should be kept hygienically for a reasonable time, and so that they lose no natural properties over a reasonable time. That leaves no margin for luxury packing.

Branded Goods

At this point it should be noted that the food manufacturers are not all of them entirely agreed with the authorities. Manufacturers of branded goods show a considerable figure for goodwill in their balance-sheets, and one of the most important props of this goodwill is, in most cases, a special type of packing. They now have to send out their products in packages covering their evident debasement with the printed promise that when the war is over they will return to their old glory.

It would require a separate article to argue the pros and cons of special packaging priority for exported foodstuffs. Britain is not generally considered a food exporter, but not only did she export certain special foodstuffs, mainly of the medicinal-nutritive type, before the war, but a trickle of such exports continues, and is not to be ignored as a goodwill plank for Britain's trade. Perhaps special liberality in the matter of package materials in so small a sphere would be justified. But so far as prestige packing at home is concerned it would plainly be wrong to allow special treatment. The question for the Board of Trade is one of supplies, and, in so far as the supplies come from overseas, also a question of bulk, to economise shipping, and of price, to economise our foreign assets.

Pre-War Prestige Containers

It is obvious that, since so much packing before the war was of the goodwill variety—prestige jars and bottles, tins and tubes, plastics and paper and cardboard—the application of the new war-time Spartan principle immediately provided a great saving, not only in the materials, but also in such necessary packing incidentals as printing and skilled labour. It is, accordingly, equally plain that the scope for saving in any one of these respects in bulk packing was very much smaller. While individual packing has suffered, without injury to what was packed, a profound modification, gross packing has not changed anything like so much since pre-war days. The industrial formula for bulk packing has always followed just those lines ordered by the Government for all packing, and mentioned above.

Although it is abundantly clear that war must cause a reduction in and simplification of packing of all sorts, and not least of food packing, it is interesting to consider how the Board of Trade viewed the problems, on the evidence afforded by the declared policy of the Cabinet, and how each effect with which we are now so familiar derived from a definite cause. In that period, extending for many months after the war had been declared, when we were still tied to the old dreams and had not been awakened by any Dunkirk, our food did not change its packing fundamentally. There were modifications and simplifications, but the question of supplies had not been thought out in terms of total war, and the purely business considerations of prestige packing seemed to have maintained their hold, though doubtless subconsciously. The summer and winter of 1940 saw some changes, but it was not until 1941 that it became possible to see the full implications of a policy designed to reserve shipping space, industrial capacity and skilled workers for direct war work.

Limiting Factors in Economy

The Government was faced with a problem inside a problem. It was easy enough to say that underwear should be taken from the shops without packing, or that cigarettes should be sold loose. But where food was concerned it was necessary to be cautious. Biscuits must still be packed in tins for delivery to the retailer (though he sold them loose to his customers), even though the South Wales tinplate industry was the subject of a programme of concentration more intense than any attempted elsewhere. Butter must still have its greaseproof paper protection. Eggs could not be moved safely with any modification of their protective wrapping. Jams needed their bottles still, and preserves of all sorts might lose something of their decorative labels but still required, within the terms of the utilitarian policy, their bottles or strong cartons. Meat extracts could not be sold loose, and while oats and even sugar might, milk could not lose its package with impunity.

There were, in other words, some obvious ineluctables, against which all the wiles of technicians would operate in vain. It is possible to see in the broad schemes of industrial "telescoping" which the Government has put into operation an awareness of the fact that there are limits to which packaging can be sacrificed without sacrificing also the security of the contents of the package. There were also limits to the extent to which packaging materials could be substituted so as to make fuller use of those capable of home production, or needing little imported additions, and so saving shipping space. The attention of the research workers turned to glass. Metal—iron and steel and tinplates—was, of course, a major product of Britain, but large supplies of ore had to be imported, and in any case production had to be concentrated on the over-riding issues of guns and tanks and planes. Wood had to be brought into the country. Paper required timber, and had a high priority, so that a great paper-saving campaign was begun to increase the supply for munitions work.

Substitutes for Metal

Packing in glass had some big advantages. Firstly, glass could be produced without recourse to big imports for the raw materials. Secondly, glass packing had the advantage of complete hygienic safety. Thirdly, the bottle or jar was an eminently returnable item, allowing for the inevitable proportion of breakages en route. Fourthly, the authorities had discovered, to the surprise of some of them, that well-constructed glass packages showed a remarkable resistance to destruction from bomb-blast, so that it became possible to think of long-term storage of foods in glass even in places not insulated from bomb shock by being underground. But there were manufacturing obstacles to any substantial degree of substitution of glass for metal, and so far these have proved decisive against any general trend.

Nor has there been any widespread substitution of plastics for "natural" packing. Plastics have been used successfully in packing as substitutes for wood and metal and glass and paper, and they have the paramount advantage that their raw material requirements are simple. If this war is long we may find the major packing trend, which is still in the direction of simplification, sometimes to the point of dispensing with packing altogether where foods are transferred from the retail shop to the final consumer, veered to the direction of substitution. But as yet substitution has not proceeded very far.

Opportunities for Economy

Before assessing the longer-term possibilities of material-substitution, a word should be said about the directions in which, and the points in the manufacturing and distributing processes at which, economy in packing can be effected. Broadly, there are two types of foodstuffs, "natural" foods and "manufactured" foods. This is not a scientific differentiation, but a trade one. In the packing connotation, oats and wheaten cereals, for instance, are manufactured foods. There has been little scope for economising in the packing of natural foods, except at the final consumer end, where they have come under the general retailer ban on the wrapping of purchases. The opportunity for economy in packing manufactured food arises at three points. Firstly, the manufacturer, dealing with the warehouseman or wholesaler, may contrive certain economies in his bulk packing. He cannot do very much, since at this end packing is purely utilitarian, but he may do something in narrowing the margin of "carrying safety", which in normal times is always large. The second opportunity, which devolves on the wholesaler in effecting delivery to retailers, is also limited, since gross packing here is also utilitarian. The third opportunity is in the final selling of the manufactured food, and here, accord-

ing to the type of food, there may be considerable scope. The retailer will in any case not waste paper in wrapping except where it is absolutely essential, and by this means a great saving is effected in the " redundant " category of packing, and effected without any loss of the virtues which packing provides. The manufacturer's effort also becomes apparent at this stage. Whatever he thinks about it, his celebrated food now has to be sold without his almost equally-celebrated packing. It is in a poorer cardboard, and less of it, and it is encased in no glossy Cellophane.

Now, it is evident that the extent to which further economy in food packing along these lines can be continued is very small. We are already near the point where, unless there is a new direction given to the search for economy (using the word in its broadest national meaning), we must cry halt. The limiting point is where packing is reduced so as to render foodstuffs unmanageable either in bulk transport or in individual carrying, or where the properties of the foodstuff are no longer adequately protected. The Board of Trade has announced that packing limitations must increase, but so far as foods are concerned it is certain that the authorities do not envisage much further saving along present lines. Flour may be sold loose, and sugar and possibly tea. But the broad movement is near its end.

Possibilities of Substitution

What then? No one will dispute that the needs of economy are no less pressing than they were, and that if possible new economies must be made. There is a way. Economy no longer means finance. It means now ships and labour and machinery, and of these primarily ships. In the opinion of many observers the Board of Trade has not fully considered the possibilities of substitution. There is no real attempt to replace the traditional forms of packing. During 1941 a great impetus was given to the packing of vegetables. The National Canning Company, which was earning around £40,000 in the years before the war, earned more than twice as much in 1939-40, the first year of war, and no less than £157,000 in the financial year to May last. This company specialises in canning fruit and vegetables, and has been the prime mover in this country in the development of " frosted food " packing. The great proportional rise in its earnings is a measure of the increase in the demand for canned goods, not alone from the public—who now are rationed for these—but also from the authorities. If there had been a substitute for cans, how great would have been the saving in an industry vital to the war effort. So far, admittedly, there has been little time to wait on technical research. The job has been to get the foods packed and stored. Now, however, we have it on the authority of the Minister of Food that our food stocks are ample. It is known, too, that research in the plastics industry, including, *inter alia*, the packing question, is intense. If the Board of Trade exerted itself to give guidance to the plastics industry on its requirements, we might find a radically new trend given to food packing in general, which would effect economies where they are most needed—in shipping, in manufacturing capacity and in labour.

Reclamation of Materials

There is also something more to be done in the direction of reclamation. The industrialist knows the difficulties with reclaimed packing tins, but even so reclamation here is important, and seems to have been insufficiently stimulated by the authorities. There is reason, too, to believe that the volume of new bottle and jar production is greater than it need be, and would be if the " return " system were working with 100 per cent. efficiency. The drive for paper for repulping is well under way, and the results achieved here indicate something of the prospects for other packing materials if only the same initiative and drive were applied to them. The problem here, however, is not just one of manufacturing difficulty, but also one of collection, which means transport and labour. So until such time as the urgency grows more acute it is unlikely that reclamation will be fully developed as an economiser.

Alternative Sources of Raw Material

As to substitution, most progress has been made, not in the direction of the total provision of new materials for the traditional ones, but in securing alternative raw sources for the manufacture of existing types. The outstanding example of this trend is the manufacture of paper from straw. Timber is excessively difficult to get, and with the nearer Scandinavian markets closed its carriage, over longer sea routes, involves a lavish use of shipping. Now, with the process of turning straw into paper efficiently developed, it is possible to expect, on the assumption of the provision of 250,000 tons of straw annually, a saving of 80,000 tons of wood pulp and many ship voyages. To the extent that such alternative raw sources are found, the impetus to substitution, and, indeed, to some extent to economy in packing, is rather impeded. But it ties up with the necessary policy of economising labour, since any general adoption of the substitution policy, while it may effect big gains in raw materials, must, because of the radical changes in manufacturing technique implied, be initially prodigal of labour.

It may be seen from the above that the problems involved in the packaging saving campaign are not at all simple, or even complementary. In the realm of foodstuffs, which are, after all, war commodities in the truest sense, the basic formula of portability, protectability and hygiene fixes the limit to quantitative and qualitative reductions in packing. We may account it a great fortune that practically all liquid foods, and a considerable proportion of solid foods, are packed in glass packages of one sort or another. Glass is not to be wasted, but it is not, in the war sense, in short supply. Had it been otherwise, had metal containers been even more widely used than they are, there may have been an enforced policy of substitution, to conserve metal supplies and to enable the redirection of labour to purely war purposes.

In retrospect, it is a matter for grateful surprise that there have, in fact, been so few radical changes in food packing. In other spheres, the contrast between packing at the end of 1941 and the end of 1939 are very striking, but in the matter of food they have been relatively small. The major reason for this is, of course, that in any case the basic requirements of food packing have always necessitated a fairly elaborate package, and there was no general framing of packages to provide superficial appeal. That was unnecessary. So now, when everything is reduced to bare essentials, we find that food has, generally speaking, really never been packed in much more than the bare essential.

Packing of Foods for Storing

The future may see more profound changes, but they will not be in the direction of reduction so much as in the direction of change. The Board of Trade's policy must clearly depend upon the course of the war. The stocking policy of the Ministry of Food obviously was based upon a certain military reckoning, and if anything should occur to require alterations in that reckoning, then the food stocking *desideratum* must change. Whether it will ever change to the point where it compels an adjustment in food packing is doubtful. There is no secret about the system on which the present stocking policy is worked, and it deserves a mention because it represents the side of packing which is juxtaposed to that of packing for ordinary and immediate consumption. The first requirement is that the packing shall protect the contents for a long period, not merely against the normal effects of ordinary wear and tear and the passing of ordinary " commercial " periods of time, but also against abnormal wear and tear and possibly much longer than normal periods of time. In these respects the nation's food for stocking was packed on much the same principles as those which guided the policy for the Armed Forces—*e.g.*, butter in tins, milk in tins, sugar and tea and flour and other dry foods in bulk. The fact that " stocking " packing is in fundamentals so close to ordinary civilian packing explains why there have been no vital changes in the latter. They have both always been utilitarian for the most part.

Paper Supplies

At this stage the implications of the changed war situation cannot be ruled out of account. The great production drive which Mr. Bevin has promised must mean every possible curtailment on the inessential use of metals and paper, and in the fairly near future we may come against the problem propounded at the beginning of this article—the problem of definition. The Board of Trade, while it cannot alter very much the type of packings which now contain the nation's food in storage and those which convey food from the manufacturer to the ultimate consumer, may possibly decide on a narrowing of the margin of convenience in the one, and of long-term safety in the other. In the latest changes of quotas under the Limitation of Supplies (Miscellaneous) Order there is nothing which will radically affect the packing of food at any essential stage. Unofficial spokesmen of the Ministry of Food, however, have intimated to the writer that still further cuts in the volume of paper supplies may be expected sooner or later, and that so far as final distribution

(*Continued on page 278*)

TINPLATE PACKAGING

SPECIALLY CONTRIBUTED

DURING the year the use of tinplate was still further restricted by the "Control of Tins and Cans (No. 4) Order." The object of the order was to economise the use of iron and was intended to eliminate the use of tinplate for many articles which were either considered non-essential, or for which non-ferrous substitutes could be found. As a result tinplate was no longer available for many dry packs, but the supply of tinplate for the packing of locally grown fruits and vegetables, and for many other foods packed in this country, was not affected.

From the consumer's point of view the quantity and variety of tinned foods offered for sale has shrunk steadily during the year, and, in particular, there is a complete absence of many well-known imported brands. On the other hand, the total amount of canned foods used in the country has probably increased substantially. This arises through the greatly increased demand for feeding the forces, and the widespread use of tins in all schemes for the succouring of "blitzed" areas. It is stated that very large stocks of foods, particularly soups, have been built up throughout the year to meet emergencies, and demands for both these purposes are likely to be sustained throughout the duration of the war.

Canned Foods for the Forces

As a corollary to the large part tinned foods play in the diet of the men in the forces is an interesting large-scale experiment carried out by the War Office to assess the nutritive value of such foods. A report of this trial has not yet been published, but it is known that a considerable body of A.A. personnel were fed for a period on an exclusively canned diet and that the results were very encouraging.

So wide a use of tinned foods, under the guidance and direction of the highest dietary authorities in the country, has gone far to complete the extinction of the lingering prejudices against the can, and must have done much to make the English woman as ardent a devotee of the can-opener as is the American housewife, and it can scarcely be doubted that the consumption of canned foods per head will be permanently raised to a higher level.

Reduction of Tin on Tinplate

The opportunities for technical progress in this country have naturally been restricted, but certain trends in America are of interest. In that country there has fortunately been no scarcity of the steel plate basis, but there has been a sustained effort to restrict the use of tin, as all supplies have to be brought in from overseas. Not only is there the fear of possible interruption of the supplies owing to direct enemy action, but the need to economise shipping space may at any time become urgent. Nevertheless, the actual position is that the United States have stocks of tin in hand sufficient for over a year. This has led to the use of a thinner tin coating on tinplate and 1·35 lb. per basic box is now extensively used in place of 1·5 lb. The thinner coating has not simplified the can-makers' problems, particularly in the soldering of the body seam, nor is it yet clear how far the thinner coating may affect the keeping qualities of certain packs. It is likely, however, that with the improved steel strip now obtainable in the more modern rolling plants some reduction in tin coating should be possible, but it will involve careful discrimination between the various packs for which the tinplate is to be used. In the meantime the can-makers have felt it desirable to withdraw the guarantee of serviceability they were accustomed to give with the heavier coated tinplate.

A departure from the usual hot dipping method of producing tinplate has now reached some measure of commercial success in the U.S.A. Coatings of tin and in some cases tin plus nickel or tin plus zinc are applied by electro-deposition. Each of these coatings has specific advantages and limitations, but their use is likely to expand with benefit to the food packaging industry.

Recent British Research

In this country two developments have been made, both originating in research carried out at the Tin Research Institute. The first refers to means by which a more even coating can be obtained in the hot dipping machine. The tin coating as customarily applied is finished by passing between several pairs of rollers, and it has now been established that by using special surfaces for certain of the rollers and applying the drive through a new type of mechanism the present inequalities in thickness can be reduced by half. This involves less porosity for a given weight of tin coating and hence improved packaging service. The second development concerns the formation of an invisible protective film on the surface of tinplate which prevents the staining of the container by sulphur-bearing foodstuffs. The film is applied by a simple chemical immersion, which can be carried out on the sheet before fabricating the cans, and not only obviates the use of expensive "anti-sulphur" lacquers, but greatly improves the resistance of the exterior of the cans to atmospheric corrosion.

Although still more difficult times may lie ahead, it is not without a measure of satisfaction that the food packaging industries can look back on the very definite progress in quantity and quality which has been achieved during the second year of war.

LETTER TO THE EDITOR

TO THE EDITOR OF FOOD MANUFACTURE

DEAR SIR,—Will you permit my writing you a couple of words on one or two of the short articles which appeared in your issues respectively, September and October, 1941. They happen to interest me quite a lot.

On page 198 there is a note entitled, "Will War-time Cold Stores be Scrapped?" To my mind, anyone worrying to-day about the possibility of there being too many cold stores in this country after the war is very short-sighted indeed, to say the least. Surely we in this country, compared, say, with the U.S.A., have hardly yet touched the fringe of cold storage possibilities. All over the country we were short of cold storage requirements before the war, and if there are more available for post-war requirements, who should worry? I think everyone ought to be very thankful indeed at the prospect.

On page 217 you publish a paragraph on Peace-time Control. War-time policy is one thing, but surely the immediate post-war period will demand something totally different. So many of the very big well-known and old-established firms in the fruit trade in all its branches have been put almost entirely out of business, to say nothing of the effect on small firms, that there definitely is already a dreadful worry as to what shall be our position immediately after the war. Trades were built up at enormous cost and effort over a long period of years; is everything to be thrown away, not just temporarily but for ever; and, if so, what is to be the future Governmental policy towards business generally, if only in so far as concerns the trade of the country and taxation, etc.?

Community Frozen-Food Lockers, page 240. To my mind a grand point for you to have brought forward, and one wonders if some people have perhaps already started to think about its possibilities for after the war?

Actually, I just wanted to write you this letter that you may know of at least one humble individual who is really appreciative of your efforts now to make others think about the future. What better time than now to plan for the post-war period? Besides, I often wonder how many of us realise that the only firms or individuals really successful in business are those who break away from the general and adopt something which puts them on a plane by themselves.

I humbly suggest that articles in FOOD MANUFACTURE, such as the three which I have instanced above, are well brought forward at the present time. It does give one encouragement to feel that someone is making others think ahead, as you undoubtedly are.

Good luck to your continued efforts and, from myself personally, many thanks to you.

F. M. KNIVETON.

WIRRAL, CHESHIRE.

MINISTRY OF FOOD

LATEST STATUTORY RULES AND ORDERS

The list given below is the continuation of the list of Orders published in *Food Manufacture*, November 1, page 256.

No.	Date. 1941.	
		PRICE FIXATION ORDERS
1221	Aug. 15.	The Eggs (Control and Price) (Northern Ireland) (No. 3) Order, 1941. (2d.)
1240	,, 20.	Amending the Onions (Maximum Prices) Order, 1940, the Soft Fruits (Maximum Prices) Order, 1941, and the Home-Grown Tomatoes (Maximum Prices) Order, 1941. (2d.)
1241	,, 20.	Directions, under the Home-Grown Plums (Maximum Prices) Order, 1941. (1d.)
1242	,, 20.	The Honey (Maximum Prices) Order, 1941. (1d.)
1263	,, 23.	The Pickles and Sauces (Control and Maximum Prices) Order, 1941. (8d.)
1279	,, 25.	Order Amending the Green Onions (Maximum Prices) Order, 1941. (1d.)
1289	,, 27.	Order Amending the Nut Kernels (Control and Maximum Prices) Order, 1941. (1d.)
1290	,, 27.	Order Amending the Nuts (Maximum Prices) Order, 1941. (1d.)
1291	,, 27.	The Flour (Control and Prices) Order, 1941. (3d.)
1292	,, 27.	The Barley (Control and Maximum Prices) Order, 1941. (2d.)
1293	,, 27.	The Home-Grown Beans (Control and Maximum Prices) Order, 1941. (2d.)
1297	,, 27.	Order Amending the Home-Grown Tomatoes (Maximum Prices) Order, 1941. (1d.)
1298	,, 27.	The Pepper (Maximum Prices) Order, 1941. (1d.)
1307	,, 29.	Order Amending the Butter (Maximum Prices) (No. 2) Order, 1940. (1d.)
1331	,, 29.	Order Amending the Canned Meat Products (Control and Maximum Prices) Order, 1941. (1d.)
1339	Sept. 2.	The Home-Grown Apples (Maximum Prices) Order, 1941. (3d.)
1347	,, 4.	Order Amending the Bacon (Prices) Order, 1941. (1d.)
1376	,, 9.	Order Amending the Jam (Maximum Prices) Order, 1941. (2d.)
1377	,, 9.	Order Amending the Fruit Pulp (Control and Maximum Prices) Order, 1941. (1d.)
1396	,, 10.	Order Amending the Imported Canned Meat (Maximum Prices) Order, 1941. (1d.)
1397	,, 10.	General Licence under the Home-Grown Wheat (Control and Prices) Order, 1941. (1d.)
1399	,, 10.	The Home-Grown Dredge Corn (Control and Maximum Prices) Order, 1941. (2d.)
1398	,, 10.	The Home-Grown Rye (Control and Maximum Prices) Order, 1941. (1d.)
1435	,, 15.	The Sugar Confectionery (Maximum Prices) Order, 1941. (1d.)
1436	,, 15.	The Chocolate and Chocolate Confectionery (Maximum Prices) Order, 1941.
1441	,, 16.	The Rabbits (Control and Maximum Prices) Order, 1941. (1d.)
1442	,, 16.	The Hares (Maximum Prices) Order, 1941. (1d.)
1468	,, 22.	The Fish (Maximum Prices) Order (No. 2), 1941. (3d.)
1478	,, 24.	Order Amending the Flour (Control and Prices) Order, 1941. (1d.)
1492	,, 25.	The Meat Feeding Stuffs (Control and Maximum Prices) Order, 1941.
1496	,, 24.	General Licence made under the Flour (Control and Prices) Order, 1941.
1517	,, 30.	Order Amending the Pickles and Sauces (Control and Maximum Prices) Order, 1941. (4d.)
1518	,, 30.	Order Amending the Soft Fruits (Maximum Prices) Order, 1941.
1527	,, 30.	Order Amending the Feeding Stuffs (Maximum Prices) Order, 1940. (1d.)
1529	,, 30.	Order Amending the Flour (Control and Prices) Order, 1941. (1d.)

No.	Date. 1941.	
		FATS
1343	Sept. 4.	The Lard (Licensing) Order, 1941. (1d.)
1356	,, 6.	General Licence, under the Lard (Licensing) Order, 1941. (1d.)
1357	,, 6.	General Licence under the Lard (Licensing) Order, 1941. (1d.)
		FEEDING STUFFS
1286	July 24.	Order Amending the Directions dated July 24, 1941, under the Feeding Stuffs (Rationing) Order, 1941. (1d.)
1332	Aug. 29.	The Feeding Stuffs (Control of Manufacture) Order, 1941. (1d.)
1333	,, 29.	General Licence made under the Feeding Stuffs (Control of Manufacture) Order, 1941. (1d.)
1456	Sept. 19.	Order Amending the Feeding Stuffs (Rationing) Order, 1941. (1d.)
1457	,, 19.	General Licence (Retailers) under the Feeding Stuffs (Licensing and Control) Order, 1941. (1d.)
1528	,, 30.	Directions, under the Feeding Stuffs (Rationing) Order, 1941. (2d.)
		FLOUR
1239	Aug. 20.	General Licence made by the Minister of Food under the Milled Wheaten Substances (Restriction) Order, 1940. (1d.)
		FRUIT
1278	Aug. 25.	Order Amending the Soft Fruits (Maximum Prices) Order, 1941, and prescribing the Appointed Day thereunder in relation to Blackberries.
1455	Sept. 18.	The Home-Grown Apples (Northern Ireland) (Control) Order, 1941. (1d.)
		MEAT
1395	Sept. 10.	The Meat (Addition of Preservative) Order, 1941. (1d.)
		MILK AND MILK PRODUCTS
1262	Aug. 23.	Order Amending the Sale of Milk (Restriction) Order, 1941. (1d.)
1380	Sept. 9.	The Milk (Size of Bottles) Order, 1941. (1d.)
1498	,, 27.	Directions under the Condensed Milk (Distribution) Order, 1940.
		VEGETABLES
1299	Aug. 27.	The Preservation of Vegetables and Vegetable Products (Licensing and Control) Order, 1941. (1d.)
1532	Sept. 30.	The Potatoes (1941 Crop) (Control) (No. 2) Order, 1941. (8d.)
		GENERAL
1234	Aug. 20.	The Food (Restriction on Dealings) Order, (1d.)
1257	,, 22.	Directions under the Sale of Food (Public Air-Raid Shelters) Order, 1940. (1d.)
1261	,, 23.	Order Amending the Rationing Order, 1939, and the Directions dated January 6, 1940, made thereunder, and the Cheese (Rationing) Order, 1941. (1d.)
1348	Sept. 4.	Directions under the Rationing Order, 1939. (1d.)
1358	,, 6.	Directions under the Sale of Food (Public Air-Raid Shelters) Order, 1940. (1d.)
1394	,, 10.	Directions under the Sale of Food (Public Air-Raid Shelters) Order, 1940. (1d.)
1415	,, 10.	General Licence under the Food (Restriction on Dealings) Order, 1941. (1d.)
1430	,, 12.	Regulation Amending the Livestock (Import from Eire and the Isle of Man) Regulations, 1940. (1d.)
1491	,, 25.	Direction relating to Oats and Dredge Corn.

NUTRITION SOCIETY

THE newly formed Nutrition Society held its first meeting in Cambridge on October 18.

The proceedings began in the morning when about 300 members and guests, among them most of the leading authorities on nutrition in the country, gathered in the lecture theatre.

The Birth of the Society

Sir Charles Martin, chairman for the morning session, told briefly how the Society had been founded. After discussing the idea with various authorities, Sir John Orr had written to twenty heads of laboratories for their opinion. The response was such that it warranted the calling of the preliminary meeting, which was held in July. A provisional committee was formed and instructed to compile a list of persons who should be invited to join and to arrange a meeting. Sir John Orr was elected chairman of this committee with Dr. L. J. Harris (Dunn Nutritional Laboratory, Cambridge) as honorary secretary, and Mr. A. L. Bacharach as honorary treasurer. Sir Charles went on to say that the science of nutrition is so much a major part of physiology that it warrants a special society for this branch, which cannot adequately be covered by existing societies. He explained that Sir John Orr, who should have addressed the meeting, had gone on a mission to America. In introducing Sir Frederick Hopkins as the first speaker, he said nobody was more suitable to be the godfather of the Society, as he had done more than anybody else to destroy the widespread complacency in the belief that calories and nitrogen alone form an adequate diet.

Sir Frederick claimed to speak only "as a voice from the past", and told a few amusing anecdotes, some of which dated back to fifty years ago. He reminded the meeting that vitamins received much opposition from, among others, one who has since done much energetic work towards securing for the people a diet containing an adequate quantity and assortment of them. One of the eminent opposers had said the "vitamin stunt" would soon pass off!

Extracts were read by the secretary out of letters from other societies and prominent persons in Britain and abroad who had sent their blessing.

Evaluation of Nutritional Status

Dr. L. J. Harris opened the scientific part of the meeting with a paper on the "Evaluation of Nutritional Status". He discussed methods for the assessment of nutritional level in man. Clinical tests often detect only an advanced deficiency. Partial deficiency causes lowered resistance and ill-health which is difficult to characterise. It is dangerous to suppose, because no scurvy is obvious in a group of people, that all are having enough vitamin C.

Curves were shown which clearly demonstrated how the average weights and heights of school children in many parts of the country had improved over the last dozen years, and how in some schools the physique had been rapidly improved with extra milk. We must beware, therefore, of using debased standards.

Dr. Leslie J. Harris, who opened the scientific part of the meeting with a paper on the "Evaluation of Nutritional Status."

Sir Frederick Gowland Hopkins, F.R.S., delivered the opening address at the first meeting of the Society, and said that the need for a nutrition society had long been felt, as the subject could no longer be considered as a subsidiary branch of biochemistry or physiology.

Laboratory methods for detecting sub-clinical deficiencies were necessary. Dark adaptation for vitamin A was offered as an example. Blood-level methods for vitamins C and B_1 were well known, and for phosphatase, prothrombin, and hæmoglobin for vitamins D and K and for Fe respectively. Urine saturation for vitamin C was well developed, and for vitamin B_1 and nicotinic acid were developing. Results of surveys on school children carried out by saturation tests before and after the provision of oranges or other graded supplements were shown on charts and proved that the method works in practice.

Dr. Harris concluded with a few words on requirements and illustrated his points with a series of rat growth curves for different levels of vitamin B_1: two units keep the rat alive, four allow it to grow, eight are much better, with sixteen it grows really well, but there is a detectable improvement on thirty-two units. With such a logarithmic growth response curve the theoretical maximum can never be reached.

Dr. H. M. Sinclair doubted the validity of the urine saturation tests because (1) individual metabolism and storage vary; (2) much of some substance which titrates as ascorbic acid has been found in the urine of a subject on a deficient diet even when the plasma level was very low, and (3) after a long continued low intake of vitamin B_1 most of the test dose is rapidly excreted. He felt that the previous intake might have as great an effect on excretion and apparent saturation as nutritional level. He stressed, too, the importance of disturbance through various nutritional elements affecting one another.

Dark Adaptation

Dr. J. Yudkin spoke for himself and Mr. G. W. Robertson on nutritional surveys, using dark adaptation, which they were doing. He showed complete curves demonstrating the great improvement found after ten days on a high carrot diet and partial reversion a week later. He then pointed out that after thirty minutes almost every subject adapts to his own final degree. The intensity of light he can just see at thirty minutes can therefore safely be used for comparative tests with an enormous saving in time. They were conducting surveys on hundreds of factory workers and school children to determine how much improvement could be had after a few weeks on multivitamin tablets and other supplements.

After lunch, during which members were able to meet old friends and make new ones, Sir Joseph Barcroft took the chair.

Dr. B. S. Pratt showed many fine pictures of vitamin B complex deficiencies, mostly from China and South Africa, pointing out such features as œdema of the legs, keratosis, pellagra, etc. He said that if vitamin B_1 does not effect a cure the disease might nevertheless be due to vitamin B_1 deficiency of long standing. What is called "African scurvy" is not curable by antiscorbutics. Only children and missionaries get it; the others drink native beer. Lastly, he showed two pictures of gold washers working a quarter of a mile apart. One group was quiet, dull and listless, the other was cheerful, noisy

and happy. Both had exactly the same regulation food, but the second group received supplements of vegetables and fruit. An excellent example of what a shilling's-worth of fruit and vegetables can do.

Children's Nutritional Status

Dr. R. H. Nobbs spoke on the difficulties of assessing children's nutritional status. A crying child may be malnourished or just "spoilt". Heights and weights for given ages reflect a child's nourishment. In spite of inaccuracies, taken in groups, these are the best simple tests. They should be supplemented with individual examination of skin, build, bones, teeth, general vitality, and of clinical symptoms, if any. Sub-clinical evidence is very important, and must be looked for with great care. Feeding during infancy has an enormous effect on later health. In Dr. Sinclair's experience every child not breast fed for six months was exceedingly prone to disease.

Mr. W. C. W. Nixon said that pregnancy reveals a state of malnutrition which might otherwise remain concealed. Vague symptoms of pregnancy—cramp, pins-and-needles, premature senility, lack-lustre eyes, shrivelled skin—usually considered normal, are clearly abnormal and due to malnutrition. He showed pictures and tables from China proving his point. Finally he hoped the birth and delivery of the new Society had been an easy one.

Animal Nutrition

Dr. C. Crowther was glad to see the Society recognised that farm animals also require nutrition. He compared the problem of farm livestock with that of the human. Ruminants, for instance, present quite other problems: in analysing human foods cellulose just counts as roughage, but for farm animals it is included with calorie-providing carbohydrate and must be more definitely characterised. Protein synthesised by intestinal bacteria adds to the animal problems. Finally vitamin and mineral shortage is rarely met in animals out of doors, but presents special problems for battery hens, stall-fed cows and pigs.

Dr. H. H. Green said vitamin deficiencies in animals are obtained as we approach the human type of dietary. Under intensive conditions in sties and stalls bone diseases are well known among animals living on processed foods. Mineral deficiencies are commoner than vitamin deficiencies. Marginal deficiencies may pass unnoticed—*e.g.*, fattening pigs begin to get avitaminosis A, but this does not show until the time the pigs go to the butcher. Each animal has its peculiar problems; for instance, battery hens have a greater and different requirement for vitamin D than mammals; grazing animals in some places abroad suffer so from phosphorus shortage that they search out and eat bones. Swayback disease is comparatively common, and can often be cured by copper even when the grass in the area contains this element: obviously some other factor is concerned. Cobalt, manganese and other trace elements each present their problems.

Dr. John Hammond exhibited a beautiful set of pictures illustrating the effect of curtailing a young animal's food. The effect of a low feeding level in infancy may persist and the adult resembles a different variety. He showed how striking is the difference between an animal on a low diet changed to high and one on a high diet changed to a low: both eventually have the same weight, but the one has a poor skeleton and fat loins, the other well-developed bones but less meat.

General Discussion

The meeting adjourned for tea, after which a general discussion took place. Among the speakers Professor Maxwell asked for methods for detecting avitaminosis earlier, and uttered the warning that diseases were frequently the result of multiple deficiencies. Dr. Kay said that better control of animal feed to produce animal food was needed—*e.g.*, of vitamin A in winter milk. He hoped for increased research on ruminant digestion and threw doubt on the ability of ruminants to absorb sugar.

Dr. Kestner reminded that two vegetable proteins, each low in one or more amino acids, might additively produce protein of good biological value. Dr. Kon drew attention to the possibility of using the mother's milk to assess her own nutrition. Dr. E. U. L. Wilkins put in a well-applauded plea for the Society to give a lead to formulating some more definite tests for Medical Officers to assess nutrition in school children. Dr. Bigwood emphasised the importance of the time factor in deficiency diseases, and told of a prison camp in Germany in which Russian soldiers developed scurvy and Rumanians pellagra on the same poor diet. This was later explained on a basis of absorption, the Russians having received a better diet in youth, thereby developing larger intestines.

During the intervals members were able to inspect various demonstrations. One by Dr. Hammond showed a collection of bones from animals on different feeding levels. Mr. A. T. Phillipson had permanent canulæ fixed in sheeps' rumen and abomasum. E. I. McDougall and Miss McAnally had slides showing progress of cellulose digestion. Members of the Nutritional Laboratory had pictures and charts to illustrate current work. These showed reserves of vitamin A in human and cattle livers; results of saturation tests with vitamin C; protection of ascorbic acid during cooking; polarographic estimation of vitamins; carotene content of common vegetables showing the pre-eminence of carrots.

CANADIAN LUXURY FOODS

Increased turnover in Canadian grown luxury foods and in the packing and processing of imported luxury foods as a result of war taxation, plus a price increase of as much as 300 per cent. on olive oil, olives and Christmas delicacies, was reported in Montreal by importers.

Olive oil, imported before the war from Italy, where a special type of oil-bearing olive has been developed through years of culture, was reported "out of stock" by two wholesalers and a third "for sale at $6 per 120-oz. container".

The pre-war price on olive oil averaged $1.75 for a 120-oz. container. Replacing the oil now are Canadian-grown soy bean oil and Canadian processed cottonseed and corn oil, according to G. S. Zakaib, head of the Main Importing Company, on St. Lawrence boulevard. The agent for the Italian Frantoio brand olive until the war, Zakaib was one of those whose orders were cancelled after the Italian merchantman *Cap Noli* was captured in the St. Lawrence the day Italy declared war.

The 1941 Christmas stock of olives, imported before the war from Spain and Portugal as well as from Italy, is being ensured only by a sharp retail price rise, according to dealers. With a 50 per cent. rise in wholesale prices, 26-oz. jars of olives—originally sold at 29 cents.—are now being emptied and reloaded into 17-oz. jars and sold for the same price.

Italian cheeses formerly used in making canned spaghetti are being replaced by American and stronger types of Canadian cheese which sell up to $1.40 a lb. Nova Scotia sardines packed in olive oil are now said to be replacing all types of European brands.

"It was just a fallacy that Canadian sardines weren't as good as anything that came in from northern Europe," said one dealer, "but it took the war and a naval blockade of European shipments to make some people believe it."

Food Packaging Today

(*Continued from page 274*)

goes, the time is coming when no wrappings whatever will be permitted unless they are absolutely necessary.

Present Packing is Adequate

These, then, are the main developments in packing during the year and the main influences now affecting the trend of packing. There are, of course, a multitude of purely manufacturing points on which there has been no space to dwell. In the main, it can be said that the reactions of the packing industry to the spartan demands of war have shown, first and foremost, the excellence of the service rendered in ordinary times. The sacrifice of a certain amount of "prestige" packing is to be regretted as a necessary evil, but in any case it has operated in food packing far less than in other spheres—the relatively "luxury" spheres where goodwill of the flimsier sort counts for so much. There has, let it be stressed, been no sacrifice of essential packing in the food industry. Some inconvenience, some minor breaks with tradition, some petty annoyances, and possibly some small errors—these have been inevitable. But the nation's food is still delivered in adequate packing, and is stored in packing rather more than adequate however the war is viewed.

THE DAIRYING OF THE FUTURE

Part II

The second, and last, instalment of a striking review of the Dairy Industry and the trend of its future reforms.

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THIS ALSO applies to the processing side. Thus one can quote stories of the sanitary inspector who gave a pasteurising licence to a separator, and of the M.O.H. who, when asked to licence a plant, said that he would be delighted to see what one looked like. These two stories illustrate the most disturbing features in the control of the industry—the inevitably large amount of bluff and ignorance present because we lack a controlling body of adequately trained and experienced persons. These examples are quoted, not to disparage any one class of authority, but to show the need for specialised training. The realisation and admission of ignorance are healthy signs, but bluff and inability to realise one's ignorance are very heavy obstructions to progress in the industry.

Coupled with the testing and control is the advisory service. It seems curious to compare the fact that the Government has proclaimed that milk is to come first in our national food policy with the treatment of the county dairy teaching staffs on the outbreak of the war. The only consistent point in the stampede seemed to be that all dairy teaching personnel had to be taken away from dairying and put on to something else—land girls, drainage, fruit canning—anything so long as it was not dairying! This lamentable mistake is now seen in its true perspective when authorities the country over are expressing their grave concern at the quality of the milk supply. Even under normal conditions one instructress may have several thousand dairy farmers to look after—the need is therefore for more and not less dairy instructors.

Advisory Services

Let us now consider what is required in the way of dairy advisory services. Three types of information are obviously required: (1) The farming or dairy husbandry; (2) the technical (chemical, bacteriological and engineering); and (3) the business and legal. It is essential that properly trained staffs should be available, and that these should be co-ordinated not only with each other but with the central independent testing body. Each of about 50 sections of the country should therefore have these three officers—the present provinces are far too large, the advisers having to look after several thousand producers. The dairy husbandry adviser should be an experienced dairy farmer competent to advise on purchase and maintenance of cows, feeding, breeding, housing and crop management. The technical adviser should be a qualified chemist and bacteriologist with a knowledge of engineering and should be competent to advise in milk production, machinery and other technical aspects. The business adviser should be an economist or accountant with agricultural experience and a knowledge of legal matters.

An advisory service of some such structure as this should be able, with the help of specialists from research centres, to give the dairy farmer all the advice required.

It must be remembered, however, that the milk producer is not the only weak link in the chain. The cleanest milk can easily be badly contaminated by dirty churns, unsterile pipe lines and general mishandling. Moreover, pasteurisation is not always efficiently carried out, and post-pasteurisation contamination is much heavier than it need be. The independent testing and advisory service would, therefore, be at the disposal not only of the farmer but of the creamery. Just as all producers' milk would be tested regularly by surprise samples, so would creameries be included in the general scheme, and churns, holding tanks, pipe lines, bottles and pasteurising plants would be tested at regular intervals on surprise visits. The efficiency of pasteurisation would also be tested by the plate count, coli and phosphatase tests.

A further point of great importance is the standardisation of all testing. At present this is in a state of chaos. No two firms carry out tests alike and subjective tests are unduly prominent. Various bodies such as the larger firms, British Standards Institution and the Society of Public Analysts have drawn up procedures for the control of dairy products, but there is no general uniformity. The M.I.C. would be in a position to appoint technical committees, on which all interested institutions would be represented, for the purpose of devising both analytical methods and chemical and bacteriological standards for dairy products.

3. *Quality payment for milk.*

The more perishable a product the more important is the quality aspect. Milk is about the only commodity that is bought and sold at a flat rate irrespective of quality, for with the exception of the designated milks, no price differences are made for fat, solids-not-fat or hygienic quality. Unless milk is obviously tainted or very badly deficient in fat or solids-not-fat, it can be very dirty, low in fat and solids-not-fat, and yet get the same price as rich milk of first hygienic quality. From 5 to 25 per cent. of milk coming into creameries is unsatisfactory, mainly for bacteriological reasons. It seems curious that with all our scientific knowledge and clean milk propaganda we should still be content with much inferior milk and suffer severe losses in every period of warm weather. We have only ourselves to blame, for the problem has never been seriously tackled. Under our present system a producer frequently puts himself at a disadvantage if he tries to produce good milk. Having gone to the necessary trouble and expense he receives about 5 per cent. extra return, and may find himself subject to constant inspection and testing while his neighbour is permitted to sell milk of a quality that should never be permitted to exist in a civilised country. Moreover, if a good producer sends to a creamery he cannot help realising that his good milk is immediately mixed with his neighbour's dirty milk. In the circumstances we must praise the public spirit of those better producers and the efforts of those who have helped in the campaign for clean milk. But this is not enough. We must stamp out the inferior product and give an adequate inducement to all to produce the highest quality milk.

The foundation of the Milk Marketing Board has contributed indirectly to the large amount of unsatisfactory milk by guaranteeing a market for all milk. To do this without any criterion of quality or penalty for lack of quality was obviously asking for trouble.

Payment on Quality Basis

Let us consider the practical aspects of payment on quality. The first point is that such a scheme would be a national scheme and that all payments would be made from a national pool. The second is that all milks would be tested at least twice a month, preferably weekly, by an independent testing body, as already described. Two methods of payment are then available—payment of a manufacturing price for milk below a certain quality, and a graded quality payment scheme. The writer favours the second for the following reasons:

(1) To differentiate milk for a manufacturing price on the platform necessitates the testing of every churn sent into the creamery. Besides the enormous labour involved, there is not yet available an objective test which could *safely* pick out unsatisfactory milks instantaneously. Obviously the decision could not be left to smell or any other subjective test.

(2) Farmers would soon realise that so long as their milk was above the manufacturing standard they would get the proper price and there would be no incentive to produce really high-class milk.

(3) The manufacturing price would be low, say, 50 per cent. or less of the full price, and either (*a*) the standard would have to be very low, or, (*b*) if high, the price difference would be a serious matter for the producer.

The whole point in a quality payment scheme is that there shall be a constant incentive to produce the finest quality milk—the better the milk the higher the price.

Let us have no delusions about quality in milk—the 10 per cent. or so bad milk in the bulk is responsible for 90 per cent.

of the troubles of the industry. It is the cause of not only sours and taints in liquid milk but inferior cheese and milk products.

The writer has suggested a scheme [10] in which the milk is tested for chemical and bacteriological quality and payment assessed on the following formula:

$$\text{Price} = \text{basic index} \times \text{total solids per cent.} \times \frac{14+Q}{20}$$

where Q is the methylene blue reduction time in hours (up to 6) or the resazurin disc number[11] after one hour.

The basic index would be determined by equating the present price to the average quality. Thus if the average bacteriological quality were 3, a milk of Q=6 would receive about 3d. more and a milk of Q=0 would, if accepted, receive about 3d. less than a milk of average quality, assuming an average chemical quality.

Use of Formula is not Complicated

Although a formula may look complicated, this calculation is, in fact, less complicated than the present system with its intricate deductions and "weightings". Although the question of "regional differentials" and "manufacturing poolings" is a matter for the economist, it is suggested that to weight prices for geographical reasons and ignore quality altogether shows a very unbalanced outlook. Milk should be valued more on its quality than on where it is produced.

A good example of the effect of this method of payment is to be found by comparing West Cornish with Home Counties milk. As it was formerly produced entirely for butter-making, a good keeping quality was not required in West Cornish milk. A butter fat bonus was paid and this milk tended to be high in fat (Guernsey cattle predominating) and of high bacterial count. The sudden call for liquid milk from Cornwall has revealed weaknesses not only on the farms but in the creameries which were not equipped to deal with milk required for the liquid market. Home Counties milk, which has been produced largely for the London liquid market, is of better keeping quality but much poorer in fat and solids-not-fat, the cattle being Shorthorn or Friesian. It has always been a complaint, and in the writer's opinion a justifiable one, that Cornish milk did not obtain a higher price than other milk of lower fat content. Now that the butter fat bonus no longer exists, Cornish farmers are introducing Friesian bulls and shorthorn cattle in order to produce milk of poorer quality but in greater quantity. On the writer's formula the rich but high count Cornish milk would obtain a lower price than the thin but low count Home Counties milk—*e.g.*, assuming a basic index of 2:

$$\text{Home Counties price} = 2 \times 11{\cdot}8 \times \frac{14+5}{20} = 22{\cdot}4\text{d.}$$

$$\text{Cornish milk price} = 2 \times 13{\cdot}4 \times \frac{14+1}{20} = 19{\cdot}9\text{d.}$$

If now the Cornish producers were to improve their methods of production and deliver a milk of low bacterial count their price would be:

$$2 \times 13{\cdot}4 \times \frac{14+5}{20} = 25{\cdot}5\text{d.}$$

(These prices are only quoted figuratively.)

In this way there would be a constant incentive to produce a richer milk by eliminating mastitis and breeding for quality and also to produce a milk of really good keeping quality (resazurin disc No. 6 after 1 hour). In the writer's opinion such a scheme, besides being logical and just, would do more for the milk industry than any other single step, and it could be anticipated that the milk supply would be cleaned up in a very short time. A rise in the bacteriological quality of milk would naturally result in a higher average price for milk or a corresponding fall in the basic index. To prevent the latter it is suggested that a third of the increase should be contributed by the wholesaler and a third by the Exchequer.

Control of Personnel

Two points require attention here—the licensing of all types of workers and the enforcement of an adequate minimum wage.

Milk is an easily perishable commodity of national importance. It is not right, therefore, that anyone should be able to set up as a dairy farmer, or retailer, or manufacturer of milk products without some form of control. Any person, therefore, desirous of assuming a responsible position in the industry would have to satisfy the M.I.C. that he had proper training in the aspect concerned. Similarly the Commission would recognise grades of workers and see that responsibility and skill were justly rewarded.

Education

Education for dairying badly needs reorganising. Our present system is faulty mainly for two reasons: (1) it is directed towards "farmhouse dairying," whereas most students take up appointments in creameries, and (2) students are taught to handle small quantities of good milk and are then expected to be able to manage large quantities of bad milk. The first essential is therefore a complete reorientation and recognition that dairying of the future will be centred round the creamery. The first steps are for the M.I.C. to take over a good creamery expressly for the purpose of teaching modern creamery practice in handling milk, butter-and cheese-making, condensing and drying milk and whey, etc. Such a creamery would also be a boon to dairy research workers who have been sadly handicapped in this country by the lack of such an experimental creamery. The N.D.D. (National Diploma in Dairying) syllabus should be split into two distinct courses, one for farmhouse and the other for creamery workers. Dairy engineering is also sadly neglected, and a post-graduate course in this should be available at a good centre for N.D.D. and B.Sc. graduates.

Much benefit would be derived from sending (or exchanging) dairy teachers and research workers abroad, especially to Australia, New Zealand, America, Denmark and Holland.

Dairy Instruction Centres

Finally, a word may be said about the outlook in dairy instructional centres. It is common to hear that "our dairy made a profit last year of ——". Nothing could be more shortsighted than this attitude. The function of a teaching centre is to turn out good students, not to make profits. It would be far better to let students learn by mistakes which spoil a few gallons of milk in the dairy school than for them to go out into the industry inadequately trained and spoil thousands of gallons in the creamery. It is obviously no good to take steps to obtain a clean milk supply if the milk is mishandled in the creamery. The chief shortcomings in creamery practice are adherence to old customs, lack of fundamental knowledge and outside experience, and the "machinery complex". By the last is meant the idea that, because the machine cost a lot of money and has automatic recording apparatus, therefore it is bound to deliver the goods, irrespective of handling. For example, pasteurising plants may cost thousands of pounds, but when controlled by untrained personnel and or the milk allowed to run out through unsterile piping or into dirty tanks or bottles, it is not surprising that troubles occur. The establishment of courses for creamery staffs in February (the slack month of the year) would be of great benefit to the industry.

Historical Development

The historical development of the dairy industry may be divided into five major periods or eras—those of "primitive", "haphazard scientific" and "efficiently co-ordinated" development and the eras of dehydrated milk products and synthetic milk. The first phase consisted of unorganised and primitive dairying and extended from the beginning until about 1890. It began to merge into the second with the ideas of processing, such as pasteurisation, applied to milk, the growth of the milk factory and the invention of dairy machinery—*e.g.*, the cream separator. The second period has seen the application of scientific methods to dairying and a gradual change to creamery control but with no central co-ordination.

The third phase will see a properly controlled industry centred on the efficient handling of liquid milk. The fourth phase will not be possible until there is available a perfect method for drying and reconstituting whole milk. Liquid milk will then become a rarity and all milk will be dried at selected centres round the country. At present we transport every year 500,000 tons of water about 50 miles unnecessarily. Not only will this be saved, but the vast apparatus of the retail milk business will disappear—the retail dairyman will be no more and the grocer have another packet on the counter. This period will probably also be noted for the successful hormonal control of lactation.

The last phase will be that of synthetic milk. Although this may sound fantastic, it may be pointed out that the synthesis of lactose, triglycerides, polypeptides and the more important vitamins has already been accomplished.

At the present moment we may regard ourselves as impatiently hovering at the end of the second period. It is to be hoped that the third will not be long delayed.

(*Continued on page 284*)

THE MEASUREMENT OF COLOUR*

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Trichromatic Colorimetric Systems

THERE is such an immediate and pressing demand for simple techniques for measuring and specifying both the colour and colour rendering properties of light sources that we are likely to see a number of new proposals put forward in the near future.

In a desire to remain loyal to the internationally agreed system, we should naturally turn to this system for a solution of our problems, and I think that we shall see that it does not fail us. I would like to remind you of some of the properties of trichromatic systems before proceeding to consider the application of our problems, and I hope the experts will forgive me for considering this problem from first principles in an endeavour to show, among other things, that the internationally agreed system is really very simple and convenient in practice.

We are all familiar with the fact that light of any colour, including " white ", can be produced by a mixture of light from three primary sources, a primary source being one which cannot be produced by a mixture of the other two. The more saturated the primary (*i.e.*, the closer they are to spectral colours), the larger will be the range of colours which can be matched by suitable mixtures of these primaries.

If red, green and blue monochromatic light are mixed and the white light produced projected on a translucent screen, the result matches white light from a tungsten filament daylight lamp. It may be that these will not appear exactly the same to everyone because of the difference in the colour sensitivity of individual eyes. It is important to note that, although the colour of the light in these two cases is the same, the spectral energy and luminosity distribution are quite different, as shown in these two diagrams (Fig. 1). For this reason the colour rendering properties will be very different, as would be seen if a number of colour filters are held in front of these two fields.

If this experiment is repeated, but this time putting a colour filter in front of the tungsten lamp and matching this light by mixing different proportions of the three monochromatic primaries, it will be seen how different are the colour rendering properties.

A colour can thus be defined by stating the proportions of the mixtures of primaries required to produce a colour match with the unknown coloured source. This can be expressed in numerical form (Fig. 2). Similarly, the luminosity can be

FORM OF NUMERICAL EXPRESSION FOR SPECIFYING ANY COLOUR.

(COLOUR) $S = \alpha R + \beta G + \gamma B$

where

(including negative values) $\alpha + \beta + \gamma = 1 \cdot 0$

(WHITE) $S_w = 1/3R + 1/3G + 1/3B$

LUMINOSITY OF COLOURED SOURCE.

$$L_s S = \alpha L_r R + \beta L_g G + \gamma L_b B$$

$$L_s = \alpha L_r + \beta L_g + \gamma L_b$$

Fig. 2.—Colour Equations.

expressed by the addition of the luminosity coefficients. But much more is needed in its definition, if its colour rendering properties are to be appraised.

The conventional manner of plotting these colorimetric co-ordinates is in a Maxwell triangle as shown in the left-hand diagram of Fig. 3; or on rectilinear co-ordinates, as shown in the right-hand diagram, where only two co-ordinates are plotted.

With any three *real* primaries, even if they are monochromatic, and consequently of 100 per cent. saturation, there will be some colours which can only be matched with a mixture involving negative co-ordinates. That is, in order to obtain a match in a colorimeter it will be necessary to mix with the test source light from one of the primaries. If the spectral colours

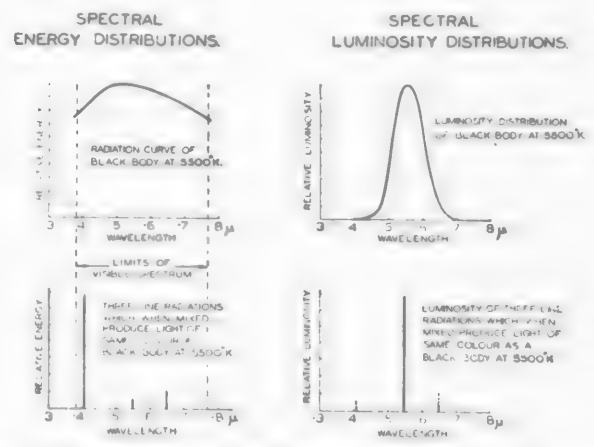

Fig. 1—Spectral energy and luminosity distributions.

(100 per cent. saturation) are plotted on the Maxwell triangle such colours will be located outside the triangle on the spectral locus. However, all colours which can be matched by positive or negative mixtures of these primaries will fall within the figure formed by the spectral locus and the line joining the ends of the spectral locus. In this form of diagram the plotted positions of the complementary colours are joined by straight lines through the " white " point.

But, in addition to the " primary colour " method just described, any colour can also be matched against a suitably proportioned mixture of a spectral colour plus " white " light, or, in the case of the magenta colours, " white " light minus a spectral colour.

Now, it is a property of the Maxwell triangle that not only does a plotted colour point in the triangle indicate the proportions of the three primaries which when mixed will match light of a particular colour, but it also indicates that an appropriate mixture of a particular spectral colour and " white " light will match the colour, already defined in trichromatic units. The two methods, which have just been demonstrated, of obtaining a mixture to colour match our source under test are therefore simultaneously indicated on the diagram.

In this triangle a line has been drawn from the white point

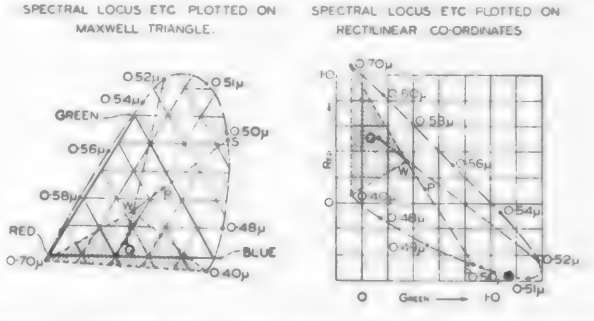

Fig. 3.—Trichromatic system with real red, green and blue monochromatic primaries.

through the colour point plotted at *P*. The hue wavelength of this colour is indicated by the intersection of the line with the spectral locus at *S*, while the saturation, or proportion of spectral to white light, is indicated by the ratio of the lengths of the line *PW* to *WS*. Any colour lying within the area bounded by the dotted line can be treated in this manner. However, the magenta colours indicated in the shaded area within the triangle are *not* spectral colours, but can be matched by white light *minus* the requisite proportion of light of a hue wavelength indicated

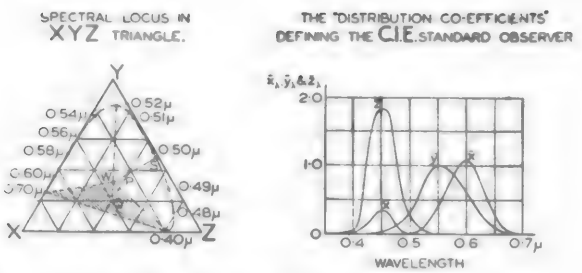

Fig. 4.—C.I.E. trichromatic system.

by the intersection of the line from Q through W to the spectral locus.

So far only one particular trichromatic system, having convenient real primaries, has been discussed. But it is possible to use any convenient three primaries chosen from the large number of real primaries available and to consider the trichromatic mixtures in the respective systems. Actually, in practice, for the reasons already stated, visual trichromatic colorimeters are used having different sets of real primaries, involving negative values in the colour co-ordinates.

It was in order to meet this situation that the system was devised which was internationally agreed in 1931. Unfortunately, in the limited space available it will only be possible to make brief reference to the system adopted by the Commission Internationale de l'Eclairage.

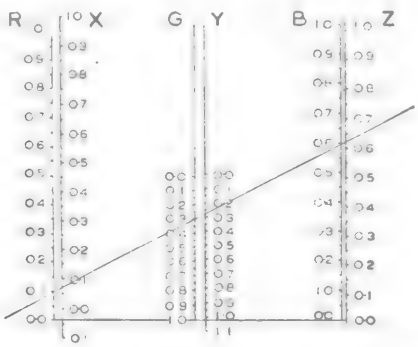

Fig. 5.—Nomogram for converting R.G.B. co-ordinates of photoelectric colorimeter to XYZ co-ordinates of C.I.E. system.

In addition to possessing all the characteristic properties associated with trichromatic systems having real primaries (to which I have already referred), as will be seen in Fig. 4, the spectral locus on the C.I.E. system is everywhere within the triangle, so that the trichromatic coefficients of all colours are positive. The primaries in this case are imaginary.

In the right-hand diagram on the figure are plotted the distribution coefficients used in indirect colorimetry for calculating the trichromatic co-ordinates from the spectral energy distribution of a source.

The relation between colorimetric systems using real primaries and the C.I.E. system is a linear one, so that the transformation from one system to another is not difficult, and in practice, for most purposes, sufficient accuracy can be obtained by using nomograms of the form shown in Fig. 5. Thus the conversion to the international system can be accomplished in a matter of seconds.

Colorimeters

It has been seen how the *colour* of the light can readily be specified on the C.I.E. trichromatic system, but the types of visual colorimeter obtainable on which such measurements can be made are generally unsuitable for making rapid routine determinations, as they require skilled observers to operate them.

A much simpler and more rapid technique has recently been evolved for indicating, to industrial accuracies, the colour of the light from a source. This is an experimental photo-electric colorimeter, which consists of three rectifier-type photo-cells covered with suitable colour filters and connected respectively to three galvanometers (Fig. 6). By an appropriate optical system the galvanometers project line images so arranged that, with the galvanometers at zero, these line images form an equilateral triangle. The light which is to be analysed for colour, falling uniformly on the three photo-cell components, causes deflections of the three galvanometers, and movement of the three lines towards the centre of the triangle. By adjusting the total amount of light falling on the cells there is one position where the three lines must intersect at one point, which therefore represents directly the location of the colour of the light source under test within this particular trichromatic system.

Thus we have a ready means of measuring the colour, but not the colour rendering properties, of a light source. But we also want to know how to appraise the appearance of coloured articles and materials—that is, the colour of the reflected light—which will naturally vary radically with different illuminants.

The colour rendering properties of a light source will depend on its spectral energy distribution. This may be different for light sources of the same colour—that is, having the same trichromatic co-ordinates.

For example, if we illuminate one-half of a white screen by light from an H.P. mercury lamp, and the other half by light from a tungsten source in front of which is a filter (actually of daylight-blue type glass), the two adjacent surfaces appear approximately the same colour. However, the colour rendering properties of these two light sources are very different, as will be appreciated when pieces of coloured gelatine filter are held in front of these surfaces.

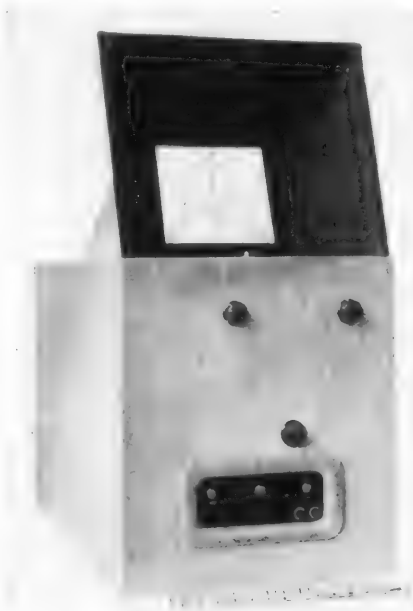

Fig. 6.—Three-galvanometer colorimeter.

Already many methods have been suggested, either based on measurements of relative energy or luminosity in various spectral bands, or on the visual judgment of the apparent colour of coloured materials, etc., when viewed under the various light sources. These methods have their uses, but are rather laborious.

Having, in the photo-electric colorimeter referred to earlier, a very quick method of measuring colour, why should we not make use of this to measure the colour rendering properties? For example, if we determine the colour of the light source, and also the colour of the light reflected from, or transmitted through, a suitably selected group of coloured materials, or filters, the relative position of these points in the colour triangle should enable not only the colour, but the colour rendering properties resulting from the particular form of spectral distribution of the source, to be determined. It will be obvious that in this case two sources which appear the same colour, but are different in spectral distribution, will be differentiated by the values of the trichromatic co-ordinates of the reflected or transmitted light from, or through, the coloured media.

• *Abstracted from the Presidential Address delivered at the Third Conference in Industrial Physics and published in the G.E.C. Journal.*

AMERICAN METHODS OF VITAMIN ASSAY

J. A. RADLEY, M.Sc., A.I.C.

A PAPER by J. B. Wilkie (*Ind. Eng. Chem.* [*Anal. Ed.*], 1941, **13,** 209) reviews the current status of the physical and chemical determinations of vitamin A. In 1880 the U.S. Pharmacopœia gave the reaction of cod-liver oil with sulphuric acid as a test for this oil, from which it would appear that the test for vitamin A was available before the vitamin was discovered biologically. The antimony chloride test is recommended by the B.P. as the method for examining concentrates, and, although it has been shown by many workers that the method is normally susceptible to many factors such as inhibitors, incorrect technique or slowness in making readings for certain classes of materials, it gives quantitative results comparable in accuracy with the ultra-violet spectro-photometric method, providing the proper precautions are taken. The photo-electric colorimeter was applied by W. J. Dann and K. A. Evelyn (*Biochem. J.*, 1938, **32,** 1008), and this reduced the observation of the antimony chloride test to an objective basis.

Ultra-Violet Absorption of Vitamin A

Providing certain precautions are taken, the ultra-violet absorption of vitamin A follows Beer's law in concentrations suitable for use with the spectro-photometer. The unit of absorption at 328 mμ is known as $E\ ^{1\%}_{1\ cm.}$ and can be used to compare results, or a factor for converting this value into biological units can be used. There has been a curious difference of opinion between English and American workers as to what this factor should be. English workers accepted the factor of 1,600, while the Americans used a factor of 2,000. K. H. Coward and S. W. F. Underhill (*Biochem. J.*, 1939, **33,** 589) have recently deduced from biological studies, using crystalline vitamin A esters and international standard *beta*-carotene, that the factor was probably 2,000 and the crystalline vitamin A prepared by H. N. Holmes and R. E. Corbett (*J. Amer. Chem. Soc.*, 1937, **59,** 2042) was found by one of their co-workers to have a maximum $E\ ^{1\%}_{1\ cm.}$ value of 2,100. Using a factor of 2,000, the pure crystalline vitamin A would therefore show a value around 4,000,000 units per gram, which is supported by biological results, indicating that its potency is between 3,500,000 and 4,000,000 International Units per gram. In view of the time and expense involved in the biological method, physical and chemical methods of estimating vitamin A are of great importance and continue to receive much attention.

In the preparation of vitamin A solutions for light-absorption measurements, carotene has been removed by adsorption on charcoal or by the use of the selective action of solvents. Although satisfactory results are reported for the absorption method, it gives rise to some dubiety in view of the uncertain molecular changes in the vitamin during chromatographic separation which have been reported by several workers.

Determination of Carotene

The recent developments in the methods used for determining carotene have been reviewed by W. J. Peterson (*Ind. Eng. Chem.* [*Anal. Ed.*], 1941, **13,** 212). Since the technique of extraction was developed by Willstätter and Stoll in 1913 nothing strikingly new appears to have been evolved, although numerous modifications of the method have been suggested. Peterson and his co-workers have recently published methods of carotene analyses which entail a considerable saving in time (*ibid.*). After obtaining the carotene solution the concentration is determined, using the photo-electric or other colorimeter, a 0·1 or 0·036 per cent. solution of potassium dichromate being used as comparison, or the spectro-photometer or Pulfrick photometer, which need only a standardising solution of carotene.

Purification of Carotene Solutions

For the purification of carotene solutions, adsorption of the impurities present on various media such as specially prepared activated magnesium hydroxide or carbonate have been found of value, although subject to a number of disadvantages which have been listed by Peterson (*vide supra*). Probably the most useful advance in the separation and identification of closely related carotenoids has been the introduction of chromatographic adsorption whereby the resolution of the different carotenes can be accomplished. H. H. Strain (*J. Biol. Chem.*, 1934, **105,** 523) has described a special brand of magnesium oxide possessing most noteworthy and desirable properties for this work. So far only partial success has attended efforts to use this technique for the quantitative separation, owing to the tenacity with which the adsorbed fraction in any one clear-cut zone is held by the adsorbant.

Determination of Vitamin B_1

The chemical methods for the determination of vitamin B_1 have been reviewed by D. J. Hennessy (*Ind. Eng. Chem.* [*Anal. Ed.*], 1941, **13,** 216). He concludes from an analysis of the sensitivity of the colorimetric and the fluorometric methods that the latter is more suitable, especially in the assay of low-potency materials. The reproducibility of the methods are of the same order, an average deviation of below 5 per cent. being obtained. The fluorometric method can be used with amounts of thiamin about one-fortieth to one-fiftieth of those preferably taken in the colorimetric methods. This worker confirms that materials interfering with either the fluorometric or the colorimetric method can be eliminated by the use of a synthetic zeolite, "Decalso", and considers that recent modifications of the thiochrome method have made it suitable for routine determination of vitamin B_1.

Rapid Methods for Determining Vitamin B_2

The increased interest in the possible sources as well as the biological properties of vitamin B_2 (riboflavin) has made it desirable to find a more rapid method of determination than that of biological assay. A. D. Emmett and co-workers review the various methods of assay (*Ind. Eng. Chem.* [*Anal. Ed.*], 1941, **13,** 219) which are the biological or feeding test, the estimation of the riboflavin by its fluorescence in solution after separation, using both visual and photo-electric devices to compare the intensities of the sample and standard, and the microbiological method in which the growth response of bacteria by following the turbidity produced in the culture medium, and the amount of acid produced in 72 hours' incubation are determined. These four methods give similar results except that, as might be expected, the greatest differences were obtained in the examination of samples of low potency. The microbiological method showed excellent specificity and reproducibility, the results being almost identical, whether culture turbidity after 24 hours was taken as the criterion or the amount of acid produced in 72 hours.

Nicotinic Acid

The estimation of nicotinic acid by fission of the pyridine ring, followed by the dianil reaction to give a coloured product, has been used in different modifications by a number of workers. Cyanogen bromide, first suggested for the purpose by W. König (*J. prakt. Chem.*, 1904, **69,** 105), satisfies the valencies of the pyridine nitrogen and allows easy fission of the ring which liberates the nitrogen as a tertiary amine. The carbon skeleton left is a glutaconic aldehyde derivative which readily enolises to give a reactive hydroxyl group, which can combine with an organic base such as aniline to give a coloured product.

A number of workers (D. Melnick and H. Field, *J. Biol. Chem.*, 1940, **134,** 1; **135,** 53: P. Pearson, *ibid.*, 1939, **129,** 491: M. Swaminathan, *Indian J. Med. Science*, 1938, **26,** 427) have used this method with success. L. J. Harris and W. D. Raymond (*Chem. and Ind.*, 1939, **58,** 652) used *p*-amino-acetophenone instead of aniline. Extensive work has shown that the cyanogen bromide reaction is not given by many chemically important cell constituents. Although the reaction is given by β-picoline and α-amino-pyridine and nipecotic acid, these materials, if they occur at all in biological material, are present only in minute amounts, and their presence in very appreciable quantities is required before appreciable colour development takes place.

H. A. Waisman and E. A. Elvehjem (*Ind. Eng. Chem.* [*Anal.* Ed.], 1941, **13,** 221) and E. Kodicek (*Biochem. J.*, 1940, **34,** 712-722) point out that in some biological materials the colour is developed, but little or no anti-pellagra may be present. In a number of cereals they consider this is due to the chromogen responsible for the colour being tied up and only liberated on

hydrolysis. They find, for example, that water extraction of corn removes the nicotinic acid but leaves the chromogen behind, so that the results obtained in this manner are more easily correlated with those given by the biological method.

It is of interest that vitamin B_6, which contains a pyridine ring, does not give the cyanogen bromide test. The reaction with nicotinic acid is influenced by a number of factors which have to be carefully controlled, and interfering pigments have to be removed. This is done by adsorbing them on activated charcoal from an alcoholic/aqueous hydrochloric acid solution before carrying out the cyanogen bromide reaction. The methods at present available for nicotinic acid estimation leave something to be desired, but they can be applied with a fair amount of success to urine, animal tissues and blood, but further work is required before acceptable values in the estimation of plant tissues are available.

Vitamin B_6

R. Kuhn and I. Löw (*Ber.*, 1940, **72**, 1453) find the Folin-Denis phenol reaction very sensitive for vitamin B_6 (pyridoxine), and they have also elaborated a specific test for this substance depending on the formation of the carbopyridinium cyanin compound from the methyl ether methyl iodide of vitamin B_6. This vitamin contains a methyl group in the α position of the pyridine ring. The *beta*-hydroxyl is methylated, and the ether formed by the action of diazomethane, followed by the addition of methyl iodide to give the quarternary pyridinium compound. When this compound is gently heated with chloroform and 20 per cent. alkali in the presence of alcohol the carbopyridinium compound is formed. According to these workers, the colour given in this method or by the phenol reagent obeys Beer's law. Using the crystalline vitamin B_6, straight-line curves are obtained connecting colour and amount of vitamin present, but the quantitative conversion of the vitamin into its various derivatives at the different stages of the carbopyridium cyanin reaction presents obvious difficulties.

The vitamin B_6 can be liberated from naturally occurring materials by pepsin digestion, followed by the removal of proteins by sodium tungstate, and of purines, pyrimidines and amidazole bases by silver nitrate. M. Swaminathan (*Nature*, 1940, **145**, 780) finds that diazotised sulphanilic acid gives a colour reaction with the vitamin B_6, and, contrary to reports of other investigators, obtained a good correlation between the chemical and bio-assays. The reaction is not specific, but other cell substances which give the reaction can be reduced to a minimum by adsorbing the vitamin, obtained as described above, on alkaline earth, eluting, and repeating the process.

Vitamin C

In the estimation of vitamin C most of the suggested methods embody the use of the reversible oxidation of ascorbic acid to dehydroascorbic acid, but, although these give reasonably satisfactory results, there are pitfalls to be avoided in most of the published procedures. The colorimetric method of estimation developed by J. H. Roe (*Science*, 1934, **80**, 561) is of interest and depends on the breakdown of ascorbic acid to furfural, which is estimated colorimetrically. The reaction with the dyestuff 2 : 6-dichlorophenolindophenol in metaphosphoric acid solution is considered by C. G. King (*Ind. Eng. Chem.* [*Anal. Ed.*], 1941, **13**, 225) to be the best for the determination of ascorbic acid. This is a direct titration method, the dyestuff being decolorised and the process followed visually.

The estimation of the vitamin in highly coloured solutions cannot be undertaken visually, and the use of a photo-electric colorimeter is satisfactory in such cases as the natural colouring matter present remains constant in colour value throughout the titration, and compensation can be made for this constant value in the results.

The use of a fluorescent indicator in ultra-violet light is another method of attack in these cases which might yield useful results. (See *Fluorescence Analysis in Ultra-violet Light*, 3rd Ed., J. A. Radley and J. Grant, 1939.) The method of Roe (*vide supra*), whilst avoiding the interfering influence of reducing materials such as 3- and 4-carbon sugar decomposition products and sulphydryl compounds, is liable to interference from substances yielding furfural on decomposition, such as pentoses and uronic acids, and is more time-consuming.

Encouraging reports have been given on the use of 2 : 4-dinitrophenylhydrazine as a precipitant for ascorbic acid, followed by hydrolysis, reduction and conversion to furfural which is estimated, or, alternatively, quantitative reduction of the nitro groups can be followed.

Determination of Dehydro-ascorbic Acid

Methods for the determination of dehydro-ascorbic acid, which is approximately as active antiscorbutically as ascorbic acid itself, are subject to great interference because many quinones, ketones and aldehydes give rise to a masking reaction when reduced by hydrogen sulphide. In some cases the interference is equivalent, almost mol. for mol., to the reversibly oxidised vitamin. C. G. King (*vide supra*) considers that the best methods for detecting and avoiding such interference are to use the furfural reaction, or the polarigraph, or to decompose the dehydroascorbic acid at a *p*H above 7 and note the resultant change in value after the reduction with hydrogen sulphide.

Vitamin D

After reviewing the various methods for estimating vitamin D, N. A. Milas, R. Heggie and J. A. Raynolds (*Ind. Eng. Chem.* [*Anal. Ed.*], 1941, **13**, 227) describe two independent physico-chemical methods for the quantitative estimation of this vitamin in fish oils. In one the $E^{1\%}_{1\,cm.}$ values (*vide supra*) at 500 to 520 mμ of the antimony trichloride colour of various fish oils are determined spectro-photometrically. Sterols and vitamin A interfere with the vitamin D absorption band, and a correction for these factors has to be made. In the second method the vitamin A, carotenoids and possibly 7-dehydrocholesterol also are destroyed by treating the non-saponifiable fraction of the oils with maleic anhydride, after which the vitamin D content of this fraction can be determined spectro-photometrically, as in the first method. Their results appear to be in fair agreement with those obtained by biological assays.

The Dairying of the Future

(*Continued from page 280*)

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Ministry of Food Items

(*Continued from page 285*)

The weighed quantity of egg is placed in a bowl and the water added a little at a time, stirring the mixture gently, until all the egg and water form a mixture free from lumps. The mixture is stirred occasionally.

It will generally be found most convenient to leave the reconstituted egg to soak overnight, and this is recommended.

Many types of reconstituted dried *whole* egg will not produce satisfactory sponge cakes when used to replace frozen or fresh eggs unless baking powder also is used.

This should generally be used at the rate of about ¼ oz. of baking powder per lb. of flour, in those sponge mixings which normally contain no baking powder. There are types which are not so suitable, and these will only produce satisfactory sponges when a higher proportion of baking powder is used.

The whisking of the eggs should be carried out at a sustained temperature of 100 deg. F., when this can be conveniently managed in order to obtain the best results. Whisking time will be generally found to take as long again as with frozen eggs.

The reconstituted egg can usually be used in all varieties of cakes in the normal manner to produce satisfactory results.

MINISTRY OF FOOD ITEMS

Poultry and Rabbits from Eire and Northern Ireland

FROM November 17, 1941, new arrangements were made for the handling of all supplies of poultry, turkeys and rabbits from Eire and Northern Ireland. The new arrangements are designed to secure a more equitable distribution of supplies and the elimination of irregular dealings.

All existing licences for the importation of poultry and rabbits from Eire were withdrawn by the Board of Trade on November 17 (licences for turkeys have already been withdrawn), and supplies of poultry, turkeys and rabbits from that country will be canalised through a trade organisation in Great Britain, known as the Association of Wholesale Distributors of Imported Poultry and Rabbits, Ltd. This Association is being formed, at the request of the Ministry of Food, from all wholesalers who imported supplies of dead poultry, turkeys and rabbits in 1938. Such wholesalers have already been invited to furnish particulars of their imports in that year, and those who appear to satisfy the conditions of eligibility are being invited to apply for membership. Any wholesalers who have not received an invitation and who consider themselves eligible should apply to the Secretary of the Organising Committee, the Association of Wholesale Distributors of Imported Poultry and Rabbits, Ltd., 64, West Smithfield, London, E.C. 1.

The exportable surplus of poultry, turkeys and rabbits from Northern Ireland will be purchased by the Ministry of Food and distributed through the Association. The Association will arrange for the allocation of supplies to its members on the basis of their trade in 1938, and members will be required to give an undertaking to the Association that they will be distributed as directed by the Ministry of Food.

Licensing of Vegetable Drying

The Minister of Food has made an Order, the Drying of Vegetables (Licensing and Control) Order, 1941, which prohibited from November 14, 1941, the drying of vegetables by artificial means except under licence of the Minister.

"Vegetables" includes herbs and tomatoes but not edible fungi.

Persons producing less than 10 cwt. of dried vegetables in a year are not required to be licensed.

Applications for licences should be addressed to the Ministry of Food, Dehydration Branch, Emergency Services Division, Glandwr, Bay View Road, Colwyn Bay.

Control of Cornflour, Custard and Blancmange Powders

The Minister of Food will shortly make an Order for the control of cornflour, custard powder and blancmange powder. The Order will define these products and will require all manufacturers, blenders and packsters to obtain licences and to conform to any conditions subject to which such licences may be granted.

The proposed Order will cover custard powder, blancmange powder and similar products which contain starch (whether cornflour or any other forms of starch), and the definitions contained in it will also have effect for the purpose of the Food (Restriction on Dealings) Order, 1941, which requires the licensing of traders other than retailers.

Preparations which, although resembling custard and blancmange powders or similar products, do not contain starch will therefore not be subject to the Food (Restriction on Dealings) Order, but to the Food (Substitutes) Order, 1941.

Manufacture of Jam

The Minister of Food has made an Order, the Jam (Maximum Prices) (No. 2) Order, 1941. This Order replaces the existing Order, but incorporates most of its provisions. Apart from a few minor additions to the Schedules, the price of Jam remains unchanged.

The Order requires that after January 1, 1942, all jam produced in the United Kingdom must bear the name and address of the manufacturer on the label. The Order also requires that from November 10, 1941, all jam must be packed in standard size containers. The standard sizes referred to in the Order are ½ lb., 1 lb., 2 lb., 7 lb., and multiples of 7 lb. The net weight of the jam packed in these standard size containers may vary, subject to certain conditions, by an allowance not exceeding one half-ounce per purported lb. This allowance or tolerance is intended to cover difficulties arising due to slight discrepancies in the net weight of the jars due to evaporation, unevenness in packing or other causes. The Order came into force on November 10, 1941.

The Food Substitutes (Control) Order, 1941

In exercise of the powers conferred upon him by Regulation 55 of the Defence (General) Regulations, 1939, as amended, and of all other powers enabling him the Minister of Food hereby makes the following Order:

1. In this Order—

   (*a*) "The Minister" means the Minister of Food;
   (*b*) "Food" has the meaning assigned to it in Section 100 of the Food and Drugs Act, 1938;
   (*c*) "Food Substitute" means any preparation or product offered or purporting to be capable of being used as a substitute for any food.

2. Except under and in accordance with the terms of a licence or other authority granted by or on behalf of the Minister no person shall by way of trade or business engage in the manufacture of any food substitute.

3. No person shall sell any food substitute except in the container in which and under the label and description under which it was sold by the manufacturer of that food substitute.

4. On and after the 10th day of November, 1941, no person shall sell or offer or agree to sell or expose for sale any food substitute unless that food substitute shall have been manufactured under and in accordance with the terms and conditions of a licence granted for the purposes of this Order by or on behalf of the Minister.

5. A licence granted under this Order shall not operate to relieve the holder thereof from complying with the provisions of any Act, By-law, Regulation or Order for the time being in force.

6. Infringements of this Order are offences against the Defence (General) Regulations, 1939.

7. This Order shall come into force on the 27th day of October, 1941, and may be cited as the Food Substitutes (Control) Order, 1941.

Manufacture of Marmalade

The Minister of Food has made an Order, the Marmalade (Maximum Prices) (No. 2) Order, 1941. This Order replaces the existing Order and contains provisions similar to those in the revised Jam (Maximum Prices) Order.

The Order requires that after January 1, 1942, all marmalade produced in the United Kingdom must bear the name and address of the manufacturer on the label. The Order also requires that from November 10, 1941, all marmalade must be packed in standard size containers. The standard sizes referred to in the Order are ½ lb., 1 lb., 2 lb., 7 lb., and multiples of 7 lb. The net weight of the marmalade packed in these standard size containers may vary subject to certain conditions, by an allowance not exceeding one ½ oz. per purported lb. This allowance or tolerance is intended to cover difficulties arising due to slight discrepancies in the net weight of the jars due to evaporation, unevenness in packing or other causes. No change occurs in the price of marmalade. The Order came into force on November 10, 1941.

Dried Eggs in Bakery Trade

The Ministry of Food, in consultation with an Expert Committee on Cake and Flour Confectionery, has compiled these notes on the use of dried whole egg for the guidance of bakers.

Samples of dried whole egg vary considerably in their effects when used in different classes of goods, and new deliveries should therefore be tried out on a small scale before being used in bulk. This is particularly necessary in the case of sponge goods.

The method of reconstitution is to take one part of dried egg and mix it with three parts of lukewarm water.

(*Continued on page 284*)

NEWS FROM THE INDUSTRY

Iron Rations for Civil Defence Workers

Supplies of iron rations are being provided by the Ministry of Food, by arrangement with the Ministry of Home Security, for civil defence services, the police, and the National Fire Service. They will be stored at convenient points and used when a severe air raid or invasion cuts off all other sources of food.

Each pack will contain 10 oz. of meat roll, two 6-oz. packets of biscuits, 8 oz. of chocolate, 12 oz. of milk, 1 oz. of tea, and 1½ oz. of sugar. This ration is intended to last one man for forty-eight hours, but the arrangement recommended is for use as a twelve-hour ration for four men, so as to avoid possible waste by individual men.

* * *

Further Government Control of Cold Storage

Under the Cold Storage (Control of Undertakings), Order, 1941, dated January 11, 1941, the Minister of Food was given power, amongst other things, to make directions as to the cold storage rates and charges which may be charged by any undertaker in operating any part of the net storage space of his cold store and for any services in relation thereto. That Order defined "net storage space" as space suitable for the safe storage of frozen meat, butter or bacon at temperatures efficiently maintainable of 14° to 16° F. for meat and butter, or of 16° to 18° F. for bacon. Under that Order the Minister of Food has no power to regulate rates and charges for cold stores not able to maintain these temperatures.

A new Order has now been made, the Cold Storage (Control of Undertakings) (No. 2) Order, 1941, under which the Minister of Food has power to fix the cold storage rates and charges for space other than that defined as net storage space in the first Order. This Order is now in force.

* * *

Imports of Canned Meat

As already announced, big purchases of canned meats have been made from overseas and are to be distributed under the new rationing scheme which came into force last month.

In this connection, Associated Canned Meat Importers has been formed as a company limited by guarantee without share capital to establish an organisation to purchase, import and distribute canned meats. It will trade on a non-profit basis.

No company, firm or individual except the Minister of Food's representative is eligible for membership of the company unless being, immediately prior to September 3, 1939, and at date of admission, engaged in importing canned meat into the United Kingdom, and in the ordinary course of this business acting as agent for overseas producers of canned meat, and the original receiver in the United Kingdom of the bill of lading.

Milk Powder Pool

Milk Powder Pool has been registered as a company limited by guarantee without share capital, with an unlimited number of members each liable for £25 in the event of winding up (nominee of Minister of Food 1s). The objects are to enter into a contract with the Minister of Food and to act in the distribution, allocation and sale of milk powders and other commodities. The Minister of Food may nominate a member of the management committee. The first members of the management committee are: Messrs. A. H. Philpot (chairman) (chairman A. H. Philpot and Sons), C. W. Carter, B. Gates (director Cow and Gate), E. F. Roberts (general manager Kraft Dairies), and L. Thomson (managing director L. Thomson). The memorandum of association is also signed by the managing director of Wilts United Dairies, and the secretary of the Association of British Manufacturers of Roller Process Milk Powder. Registered office: Room 40, Hotel Rothesay, Colwyn Bay, North Wales.

* * *

Standards for Ice Cream

Under the auspices of the Midlands Division Ice Cream Association, a lecture by Mr. L. J. Hynes will be delivered at the Birmingham Chamber of Commerce on December 3 at 2 p.m.

In a letter to members of the Association announcing the lecture, they are reminded of the discussion which took place before the war regarding the establishment, which appeared imminent, of a Government standard for ice cream. The war came and the matter was necessarily dropped.

The letter goes on to point out that as soon as the war ends the question will be revived, either by the Government or by the trade itself. Unless, when the time comes, the industry is prepared to make its voice heard on its own behalf it may find itself saddled with legislation, whether or not the principle of a standard be approved, which will not find favour with the majority of those whom it will affect.

Mr. Hynes, who is a contributor to FOOD MANUFACTURE, will treat the matter from all angles. He is well qualified to speak on the matter of standards for ice cream as he has made the subject his special study. His lecture is being delivered by kind permission of Facchino's Purity Biscuits, Ltd., with which firm he has recently taken up an important appointment. It is stressed that all members of the trade will be welcomed whether members of the Association or not.

* * *

Electrochemical Analysis

The electrochemical analysis apparatus described in a leaflet recently issued by Griffin and Tatlock, Ltd., has been developed specially to meet the heavy war-time demand. By its use analysis of alloys—a matter of great importance to all metallurgical industries—can be carried out with a rapidity normally unapproached by chemical methods.

Decontamination of Milk

In a recent announcement on the protection of milk from contamination by poison gas, the statement was made that in certain circumstances it might be possible to decontaminate milk by suitable heat treatment. Some misunderstanding appears to have resulted from this statement, which was intended to apply only to very large quantities of milk which had been very lightly contaminated by mustard gas vapour. In the case of arsenical gases such as lewisite there would be no alternative to destruction.

Under air-raid conditions, it should be taken as a general principle that if milk has been contaminated by poison gas, then in view of the many practical difficulties that would be involved in its successful recovery it will have to be destroyed.

* * *

Canned Venison

It is reported that there is a big plan to supplement existing food by supplies of canned venison.

A venison canning factory is already in operation, and its products have been distributed in several large centres, including London.

Two difficulties stand in the way of rapid development. The first is that this is a bad season for deer, the cold spring having affected the herds in many parts of the Highlands.

The second is the shortage of stalkers, many of whom are now in the Army.

If it can be put on the market in a form and at a price which will meet the working man's pocket, canned venison should become a popular item in the national menu.

* * *

Brazil's Citrus Industry

The elimination of European markets as a result of the war is said to have created a crisis in Brazil's citrus industry, centred in São Paulo. In an attempt to meet the crisis steps are being taken to develop the by-products industry. The nature of the situation is indicated from the fact that during 1940 exports from one port alone dropped to 780,000 boxes from the 1939 figure of 2,394,393 boxes.

* * *

Power Alcohol from Sugar

A committee which has investigated the production of power alcohol reports that the three existing distilleries at Sarina (Queensland), Pyrmont (N.S.W.), and Yarraville (Victoria) are using all the molasses available, and it suggests the use of raw sugar to supplement output by keeping the distilleries at their full capacity continuously. This would add four or five million gallons a year to the total production, which is expected, in any event, to reach four million gallons by the end of the year. Four and a half million gallons of power alcohol could be produced from 36,000 tons of sugar.

Post-War Reconstruction

Immediately hostilities cease, factory war work will terminate overnight. Therefore, unless steps toward post-war reconstruction of manufacturing operations are taken now, for thousands of British industrial firms the end of the war will mean empty order books, idle plants and no plans for the future.

As a solution to the problem that must inevitably face almost all branches of the engineering and allied industries, the potential value that new American inventions, processes and products would have if properly exploited in Great Britain, under licence from the American patent holders, is a factor that merits serious consideration. This is specially true of such devices or products as cannot profitably or conveniently be exported from the U.S.A.

A brochure outlining certain services of value to British industrialists who are seeking a solution of their post-war reconstruction problems, especially those who would welcome an opportunity to acquire manufacturing rights in Great Britain to new and successful American patents, processes and products has been issued by Engineering Developments (England), Ltd. These services are performed by a responsible organisation operating in conformity with Government policy.

Engineering Developments (England), Ltd., in conjunction with its associated company in the United States (The Commonwealth Engineering Co., Dayton, Ohio) is in constant touch with the engineering and allied industries of both nations.

* * *

New Rabbit Scheme

Mr. H. W. Chadwick, presiding over a meeting of the Fur Trade Export Group recently, announced a plan for trapping more millions of wild rabbits and breeding larger numbers of tame ones to increase supplies of both food and pelts. He said that the scheme was far-reaching and would operate not only during the war but should also develop into a very important part of the British fur trade in peace-time.

Lord Forbes, of the Industrial and Export Council, emphasising the need to increase exports to the United States and Canada in order to provide more dollars to pay for our war necessities, said that the new campaign would help to "convert British bunnies into bombs". The value of our exports last year of raw rabbit skins and in the form of hatters' furs was approximately £930,000. Exports for the first six months of this year amounted to over £920,000, and seemed likely to be over £2,000,000 by the end of the year.

The rabbit catch in this country last year was about 60,000,000, a figure it was hoped to surpass this year.

Mr. James Bradley, chairman of the Rabbits and Moles Committee, announced that pamphlets on the best way to trap and skin rabbits and moles would be sent by the group to women's institutes, rabbit clubs, and similar bodies who applied for them. The demand of the American markets for the skins was much greater than the supply, and this offered a chance to exploit two products of our land.

School Meals

Mr. Frederick H. Pickering, Chairman of Board of Managers, Blue Coat Schools, Durham, in a letter to *The Times*, stated recently that for the past nine months 200 children have been provided with a midday meal consisting of meat or fish together with vegetables, bread, fruit and milk. The children, if they can afford it, pay 2d. a day, and, apart from the initial cost of creating the canteen, it is not apparent that its daily expense will be a burden to our local rates.

There was no public demand for this venture, but there is now widespread appreciation of its beneficent value to the health and general well-being of our children. In fact, the local education authority have been so impressed with the obvious improvement in the physical and mental development of our scholars that they are now installing similar canteens in other schools. Facts are more potent than theories.

* * *

Concentrated Rations for Troops

Service caterers have eaten a luncheon prepared from concentrated army rations devised by research workers in the new food trades school here, writes the Melbourne correspondent of *The Times*. It included rissoles made from dried meat and army biscuits, with dried parsnips, carrots and potatoes; pancakes of wholemeal flour, and stewed dried apricots, with cream made of dried milk and saltless butter. The vegetables looked and tasted fresh.

Mr. C. Massey, chairman of the Defence Foodstuffs Committee which victuals the Services of half the Empire, including all the Navy east of Gibraltar, declared that the rations were satisfying, nourishing, tasty and well balanced. They would be very valuable to the Air Force and parachute troops, as well as to the Army and Navy, and a welcome addition to the iron ration of troops lacking fresh supplies. They would keep a long time packed only in waxed paper, and their weight was a fifth of that of the raw ingredients.

* * *

Protective Wall Design for Factories

The 13½-inch brick wall, like its alternative in mass or precast concrete walls and earth barriers, was originally recommended by the authorities as affording a reasonable degree of protection against blast and splinters at distances of 20 feet and upward from the smaller types of H.E. bomb originally largely used by the enemy. This type of bomb still constitutes an appreciable proportion of the bomb loads of many enemy aircraft, and against these missiles the 13½-inch brick baffle wall has proved itself capable of affording adequate protection where the burst is not too close.

It is not practicable to apply strengthening methods to existing 13½-inch brick baffle walls; but where it is considered that the personnel and machinery involved really require a very high degree of protection, the demolition of non-reinforced work must be carried out and its place taken by reinforced structures such as those described in the Ministry of Home Security's Circular C. 18.

The Clay Products Technical Bureau of Great Britain, Ltd., have issued details of relative costs, etc., of brick and concrete walls as illustrated in the aforementioned circular.

* * *

Moisture Loss in Apples

Conditions similar to gas storage are obtained by using a moisture-proof Cellophane container, states *Modern Refrigeration*. What determines the degree of atmospheric control, however, is the extent of porosity of this container. Thus we have the Cellophane performing a storage function as well as impeding moisture loss, these functions being additional to the normal function as a container. In actual tests, moisture was retained to such a point that little or no loss in weight was noted over several months' storage. It was also found that carbon dioxide was retained to a concentration of 3 to 9 per cent. This very fortunately approximates suitable gas storage conditions for most varieties of apples. Varieties successfully stored under these conditions were McIntosh, Spy, Linda, Sandow, Cortland, Lobo, and Lawfam.

This accumulation of gas, however, has been found harmful for the Cox's Orange Pippin variety which necessitated a $\frac{1}{16}$-in. hole being made in each bag. With this small diffusion hole beneficial results were obtained for this variety.

The type of container being tried at present at the Division of Horticulture, Central Experimental Farm, Ottawa, is a gallon wedge-shaped bag with glued seams. These are tied at the top with a strong tag. After filling, the bags can be packed in a half-bushel—four bags—corrugated cardboard carton. In this way, the retailer can purchase half-bushel lots which can be sold to the consumer in quantities of one gallon or more. The consumer in turn is able to keep the apples at home in the Cellophane bag, thus using the moisture-proofing properties of the Cellophane until the last apple is consumed.

* * *

Defence Advisory Panel

The Glass Manufacturers' Federation has appointed a Committee of Scientific and Technical Advisers known as the Defence Advisory Panel. The Panel has prepared for general distribution a brochure on the properties of glass. Communications for the Advisory Defence Panel should be addressed to Geoffrey Marchand, M.A., Director, Glass Manufacturers' Federation, Orleans, Latimer Road, New Barnet, Herts.

* * *

Chemical Society's New President

Dr. W. H. Mills, F.R.S., has been elected President of the Chemical Society in succession to the late Professor J. C. Philip, O.B.E., F.R.S., *Fellow*.

The Material of Infinite Uses

An interesting booklet has been issued by Bakelite, Ltd., with the above title. It starts with a review of the origin of synthetic resin. The manufacture of Bakelite moulding and laminated material, the decorative grades of which are made in beautiful patterns and colours, are described. Excellent dielectric properties and immunity to heat have won an important position for Bakelite insulating varnishes in the electrical industry. Several classes of clear lacquer are made, some of which are air-drying while others require stoving. Another application of the material is the cement used for the setting of bristles in paint and shaving brushes, etc.

The foregoing are some of the many uses of Bakelite products, and the outline given in the brochure may suggest possibilities for their incorporation in new or existing products.

* * *

Small Steam Turbine Sets

In the milk and general food industries, as in all others using low pressure heating and process steam, a highly efficient practice is to use a small steam turbine, which may be less than 100 h.p. if necessary, on the back pressure principle, running at say 4,000 to 6,000 revs. per minute, and driving, through totally enclosed reduction gearing, an electrical generator or shafting by means of a belt or rope. Under these conditions all the steam from the boiler is passed through the turbine and discharged at the necessary low pressure for heating work, giving an extremely high overall thermal efficiency, since there is no latent heat or steam loss.

A typical example of the latest practice in connection with small steam turbine drive is a back pressure installation recently supplied by Hick, Hargreaves and Co., Ltd., of only 90 b.h.p., running at a speed of 4,500 revs. per minute, which is reduced to 1,000 revs. per minute by single-reduction double-helical gear drive, operating a short extension shaft on which is mounted a Vee-rope pulley. The steam pressure at the turbine stop valve is 160 lbs. per sq. in. gauge—that is, ordinary boiler pressure—while in this particular case the steam is discharged from the turbine for heating and process work at 10 lbs. per sq. in.

A New Product for Food Manufacturers

Salted fish is now on the home market (mostly exported pre-war). As good supplies are assured for at least twelve months, it should prove attractive to all manufacturers looking for an article to replace their usual pre-war raw material, which may not now be obtainable in sufficient quantities.

Salted fish is simply the finest fresh fish, which is split open immediately it is caught, and preserved by salt. The splitting consists of removing the head and a large proportion of the backbone. In the process of curing a good percentage of the normal water content of the fish is eliminated. It takes two tons of fresh fish to make one ton of fully cured salted fish.

Many food manufacturers have already investigated the possibility of this article and are now in production, using substantial quantities every week.

It is probable that food manufacturers, large and small, will be interested in investigating the possibilities of this product, and they are advised to communicate with Messrs. Hampshire, Birrell and Co., Ltd., who have been exclusively salted fish curers and merchants for one hundred and twenty years. They hold substantial stocks, which are constantly moving and being replenished, and are processors to the Ministry of Food and are official agents of the Ministry.

* * *

Cartons for Edible Fats

A carton manufactured only from the finest quality greaseproof or vegetable parchment obtainable is made by Cheverton and Laidler. It is used for containing edible fats, the advantage being that these can be poured in whilst still hot, the container having a reinforced base, thus avoiding leakage. It is a hygienic and modern method of packing fat, and can also be used for waxes and polishes and various kinds of powders. These containers are approved by the Royal Institute of Hygiene.

* * *

Gums and Resins

The food industry is a large buyer of gums and allied products. M. Hamburger and Sons, who have their factory at Send, near Woking, inform us that they supply gum tragacanth and gum karaya to specification and, moreover, guarantee deliveries. At the factory there is a drying plant which has proved useful to various customers, in particular dealing with materials which have been damaged due to enemy action. The firm imports their different gums direct and have their own connections in the countries of origin.

* * *

Vacuum Equipment

A series of leaflets describing their vacuum equipment has been issued by W. Edwards and Co. (London), Ltd. They describe standard and new types, among the latter being two two-stage models of diffusion pumps for the production of high vacua. It is claimed that with the addition of these two models to the firm's existing range of mercury-diffusion pumps, any possible research in manufacturing requirements can be satisfied.

Another leaflet describes condensation pumps employing oil of a very low vapour pressure. All the pumps described operate on the diffusion principle, employing Apiezol oils as the working fluid.

* * *

Fourth Addendum to the B.P.

The Fourth Addendum to the British Pharmacopœia, 1932, became official in Great Britain on October 1, and copies are now obtainable, price 5s.

Moulded Pulp Containers

The packing industry is probably suffering as much as any trade due to war conditions, write Universal Pulp Containers, Ltd.

By far the largest proportion of packaging manufactures are made on the basis of paper in some form or another, and as little or no pulp, from which paper and paper goods generally are manufactured, is produced in this country, it is a natural consequence that a very considerable shortage of paper and paper manufactures has resulted. The great bulk of pulp imported before the war came from the Scandinavian countries, and this source of supply, since the occupation of Norway by the enemy, has been completely eliminated. This has led to a very extensive use of waste paper to replace pulp. A very considerable shortage of cardboard and composite containers has been felt, and this has led to many a small revolution in packaging.

The manufacturers of moulded pulp containers have in many cases come to the rescue, as owing to their special process being a moulding one, shape does not offer the same difficulties to them as it does in other forms of manufactured packages. They have also been able to offer the advantage of embossed lettering on their containers, which in some degree makes up for the small labels allowed by the Paper Control.

There is no doubt at all that the most noticeable feature in the repercussion of the war on the packaging industry is the use of such vast quantities of waste paper; it is to be hoped that supplies of waste paper will not diminish, especially as much of it is also needed for materials of war.

* * *

Tablet Machines

Manesty Machines, Ltd., continue to develop machines for the food industry, and their tablet machines are well known, the larger models being extensively used for the production of soup cubes, tea, coffee, cocoa, lemonade and milk tablets, confectionery and iron rations. The smaller tablet machines, including the rotary machines with an output up to nearly 100,000 per hour, are used extensively for the production of saccharin tablets. Flavouring essences are also prepared in tablet form and from day to day new products continue to be developed in the popular and convenient form produced by tableting.

The Manesty Oscillating Granulator was originally designed to produce granules for tablet machines, but it is a machine which has now found many other uses. It consists of a slotted stainless steel rotor which oscillates over an interchangeable stainless steel screen. It will convert fine powders into granules by the use of a minimum of granulating fluid. Alternatively, it will break down caked or crystalline materials into granules without the production of excessive "fines". Further uses for the machine comprise mixing (generally of materials which are inclined to ball up), and some users find it extremely useful for sifting.

Sale of Creamery

The question of the sale of the creamery of the St. George Co-operative Society, Glasgow, to the Scottish Co-operative Wholesale Society was considered at a meeting of members of the St. George Society recently, and the board were unanimously empowered to continue negotiations to a final agreement.

* * *

New Food from "Amla"

A new food from the Indian gooseberry (amla) is being manufactured at the Nutrition Research Laboratories, Coornoor. Large quantities of gooseberries are arriving from the neighbouring districts and these are being powdered here and then sent to other parts of India for conversion into tablet form. The new food is intended, among other purposes, to be sent to famine camps and desert areas where vegetables cannot be obtained.

* * *

Stoneware Containers

The importance of selecting the best available material for vessels for the storage of foods and drinks both for everyday use and for emergency purposes cannot be too strongly emphasised. Among the main points to be considered are the following:

(1) The containers should be produced from native British materials which are not required to any major extent by the armament and allied industries;

(2) they should be non-porous and absolutely hygienic; capable of being sterilised and with easily cleaned smooth surfaces;

(3) the material from which they are made should have a low heat conductivity, so that contents may be kept cool and fresh as long as possible;

(4) the containers should be of pleasing appearance and reasonable in price.

Doulton Cream Glazed Stoneware is a material which satisfies all these conditions and can be produced in a wide range of shapes and sizes to suit the needs of various households.

Some foodstuffs are best kept in air-tight vessels. Containers for this purpose are made with either ground-on lids, fitted with special locking device, or with screw stoppers and rubber washers. Where it is preferable to have a vessel which is covered but not air-tight, the plain upright shape with loose cover is an excellent design.

Liquids may be stored in containers of various designs and the special A.R.P. Water Container shown in the illustration has been found by experience to be very suitable for this purpose.

Apart from their practical fitness for this purpose, the simple design and very pleasing cream glaze of these containers make them most attractive in appearance.

Dipped Apples

Demonstrations of a method of treating apples in order to lengthen their storage life were given last month at East Malling Research Station and Long Ashton Research Station.

The method has been under investigation by the Department of Scientific and Industrial Research. Before putting into store the apples are dipped in an oil emulsion.

Further details will be followed with very great interest.

For some time now experiments in waxing apples have been carried out in the United States. A recent note describes such experiments at Summerland, British Columbia. In these the wax has consisted mainly of carron oil and paraffin with the addition of an emulsifier. Dipping of the apples was carried out at a temperature of 105° F. and the fruit was dried on newspaper.

We understand that waxing was done within forty-eight hours of picking and that wrapping and storage was done within twenty-four hours of waxing, the temperature of the storehouse being 38° F.

It appears that waxing reduced shrinkage of the fruit under conditions of low humidity, but not under conditions of high humidity. Flavour was not appreciably affected and the saleable period of the fruit was prolonged after removal from store.

There seems to be much room for investigation as to the commercial possibilities of waxing apples in our own country, says the *B. & G. Review*.

* * *

American Farm Policy

Mr. Claude Wickard, United States Secretary of Agriculture, has announced the 1942 farm programme. Production of most crops, and milk, pork, eggs, cheese, etc., has been set for new high levels, but the rigid production and marketing controls for wheat, cotton, and tobacco are to be continued. He said that Great Britain expected to take 6 to 8 per cent. of the American 1942 farm production, and other nations 2 per cent., which would double the 1941 exports. All restrictions on production of sugar in the United States, which has been under rigid quotas since 1934, are to be lifted, in order not to risk a sugar shortage due to shipping troubles.

Britain Delivers the Goods

W. J. Gainer, of Semaphore, South Australia, in sending his renewal instructions to FOOD MANUFACTURE says:

"Since the war began only two copies of your magazines FOOD MANUFACTURE and *Manufacturing Chemist* have not reached the above address. Although taking longer because of the route the goods are delivered, and this is indeed in keeping with the slogan, 'Britain delivers the goods'."

* * *

Correspondence Course in Industrial Law

With the entry into factories of more persons on the labour and personnel management side, the Industrial Welfare Society's Correspondence Course in Industrial Law serves a useful purpose in providing them with the necessary knowledge of the legal principles affecting their work. One of the main advantages is that the course does not presuppose previous legal training on the part of those taking it, and the various points are explained in non-legal and ordinary language.

The course consists of six complete lectures on the following subjects: The Law of Master and Servant; Factories Act; Truck Acts; Trade Boards; Employers' Liability and Workmen's Compensation; National Insurance; Law Relating to Works Welfare; together with the answering of the questions submitted by the individual student. The War Emergency Legislation on these subjects is also covered.

Applications for joining the course or for further particulars should be made to the Secretary, Industrial Welfare Society (Incorporated), 14, Hobart Place, Westminster, S.W. 1.

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Fire Protection and A.R.P. Year Book

The 1941-42 edition of the *Fire Protection and A.R.P. Year Book* (310 pp., bound cloth, 7s. 6d.) gives, under thirty-two heads, particulars of the more important fire brigades throughout Great Britain and the Empire. Other sections contain lists of the names and addresses of principal fire officers and A.R.P. officers. Details are given of the personnel and works of appropriate Government Departments and Civil Defence Organisations.

Legislation affecting the fire service is dealt with, and a new feature is a consolidated list of Statutory Rules and Orders still in force which bear on civil defence organisation. The many new standards for A.R.P. equipment issued in the last year have been summarised. A directory of suppliers of A.R.P. and fire-fighting requisites and a full list of proprietary and trade names conclude this work.

The book, which runs to some 310 pages, is of a handy size, excellently bound in red cloth with gilt lettering, and no one who is connected in any way with the fire service or civil defence administration should be without a copy.

OBITUARY

W. J. Bush

On Thursday, November 20, 1941, James Mortimer Bush, third son of William John Bush, a founder of the firm which bears his name, passed peacefully away in his seventy-ninth year. Thus ended a lifetime of service and devotion not only to his firm and trade but to all the trades with which he came in contact.

He was a man greatly beloved by his colleagues and staff, and his passing leaves a gap that only time can fill with memories of his kindness, endeavour and impartiality.

Born on the 29th October, 1863, at Ash Grove, Hackney, he was educated at private schools in England, Belgium and Germany, and went through a course of chemistry under the late Professor Attfield at the Pharmaceutical Society School in Bloomsbury Square.

He married Miss Mabel Gade Uzielli, who died in 1935. With his passing he leaves one son, Eric Lionel Bush, a director of the company, now holding a commission in the Royal Artillery.

Sixty-two years ago he began work in the factory, going through all departments in turn, later for several years taking complete charge. It was this early grounding on the manufacturing side that enabled him to maintain so firm a control on the activities of a fast expanding business. Shortly before the death of his father he was admitted into partnership, and when in 1897 the business was converted into a limited liability company he assumed the position of joint managing director with his brother, Alfred Walter Bush, under the chairmanship of his elder brother, William Baron de Bush. On the Baron's death in June, 1903, "J.M.B." succeeded him as chairman, still retaining his managing directorship. This position he held until his death, and during the last decade was affectionately known to all his employees as the "Chairman".

He was one of the founders of the British Essence Manufacturers Association, and since its inception in 1917 was the Association's chairman; also, in May, 1940, he was elected chairman of the Essence Export Group. It has been said of him that his sense of taste and smell was one of exceptionally high order.

A member of the Worshipful Company of Loriners, he was also a Freeman of the City of London.

During the present war he refused to vacate his town flat, and it was not until he had been bombed out twice that he moved and lived either at Brighton or Northwood.

Up to the last he was an active man, attending the office four or five days a week. He died preparing to go to Hackney, where so much of his energy, life and interest had been centred, and, as he would have wished, in harness!

* * *

William Macnab

William Macnab died at Cookham Dene on September 2, in his eighty-fourth year. He studied chemistry and allied sciences at Glasgow University, under Ferguson and Ramsay (as demonstrator), and at Anderson's College under Mills. In the first few years of his professional life he was engaged as an analyst in the sugar industry at Magdeburg, Germany, and later in London. Then, for a few years, he was concerned with chemical engineering problems, and installed plants in Canada and the United States. For his services in the last war he was appointed a Commander of the Most Excellent Order of the British Empire.

In 1909 he was Honorary Secretary of the Seventh International Congress of Applied Chemistry, in 1910 a member of the Jury of Brussels Exhibition, and in 1911 a member of the Jury of Turin Exhibition. In 1922 he delivered the Hurter Memorial Lecture before the Liverpool Section of the Society of Chemical Industry, dealing with explosives production in this country and in France during 1915-1919.

He was one of the Founders of the Institution of Chemical Engineers, of which he was President in 1934.

He was elected an Associate of the Institute of Chemistry in 1882 and a Fellow in 1887; he served as a member of Council for four periods of three years each between 1893 and 1921, and as Vice-President from 1921-1924.

* * *

COMPANIES

H. J. Heinz Co.

The nominal capital of H. J. Heinz Company has been increased by £800,000, in £1 Ordinary shares, to £2,000,000.

The company was formed in 1917. Its products carry the well-known trade name of "57 Varieties". The nominal capital was originally £50,000, and has been increased as follows: To £150,000 in 1924; to £300,000 in 1927; to £1,200,000 in 1936; and to £2,000,000 this month.

The original business was founded in 1869.

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Milling Shares

The final conclusion of the protracted negotiations over the war-time remuneration of the milling industry has attracted some attention to this generally quiet, uneventful section of the industrial market, states *The Financial News*. It would appear that the millers have obtained fair terms from the Government if, in fact, 1938 earnings have been selected as a basis for the calculation of war-time revenue. For some time earnings of the leading milling companies have shown an enviable stability, and the maintenance of that stability is now guaranteed for the duration of the war.

The yield obtainable on the milling equities best known to the investing public is given in the following table:

Company.	*Last Div. %*	*Present Price.*	*Yield %*
Charles Brown (10/)	4·0	—	—
Hovis (£1)	20·0	98/	4·1
McDougalls £1) ...	10·0	31/9	6·3
Ranks (5/)	15·0	16/3	4·7
Spillers (Defd. £1)	15·0	48/6	6·2

The relatively low returns provided by the Hovis and Ranks equities are in part due to their special popularity with the market, and are justified by the undoubted strength of the financial resources of the two companies. But McDougalls and Spillers have equally good records and are possessed of ample reserves. The wide gap between the Hovis and McDougalls quotations is therefore hardly justified, while even the high gearing of the Spillers Deferred shares is more than discounted in the price.

The milling trade is not, of course, entirely dependent upon flour milling for its turnover. Dog biscuits, poultry and animal foods, cereal products, etc., are profitable side lines which, subject to supply difficulties, should still be yielding good profits.

* * *

Cerebos Tax-Free Interim

Cerebos has decided to pay a tax-free interim of 10 per cent. as compared with 10 per cent., less tax. It paid a final of 30 per cent. for 1940, making 40 per cent., less tax. Up to 1932-33 the company paid its dividends tax-free.

Issued capital is £1,000,000 in £1 shares. The company's principal products include Bisto, Cerebos, Saxa Salts, pepper, baking powder, etc.

* * *

The Price of Game

Elderly sportsmen like myself must be marvelling at the prices obtainable for some of the less desirable kinds of game. "Blue" hares, which when shooting on Scottish moors we were told not to bother about as they only added to the weight to be carried home and were "only fit for the stockpot anyway", are controlled at 4s. 6d. each. Old woodpigeons, which as boys—when we got considerable quantities at times—we were lucky to dispose of at 6d. each, were selling in Guildford and elsewhere last autumn at half a crown each, and, final touch, the price of an ancient grouse, only fit for casserole or potting, was 5s. 6d. at any London stores last week.

(*From a letter to "The Times".*)

INFORMATION AND ADVICE

Glacial Acetic Acid—Tinned Rabbits—Adhesives for Labels—Information Supplied

Glacial Acetic Acid for "Pickling"

7,175. *I am interested in establishing a little food industry—namely, fish and other things in "pickled jelly". Do you know of any regulation against the use of glacial acetic acid for "pickling"? I am told glacial acetic acid is used for these purposes on the Continent and that our "pure malt vinegar" does not give quite the flavour desired.* (London.)

We cannot see any advantage in using glacial acetic acid, which would have to be diluted in any case. It is probable that, for the purpose you need it, pure malt vinegar would impart a better flavour.

Tinned Rabbits

7,188. *Please let us know if you could put us in touch with any firm who could give us any information with regard to tinned rabbits, also some information with regard to the equipment.* (Cork.)

We do not know of any firm that specially deals with tinned rabbits excepting the canners themselves who, of course, would not give any information about their procedure.

The tinning of rabbits follows the usual principles of flesh food canning and the main items of plant would be the cooking equipment, the can-closing machine and retort. As regards canning machinery, you will, no doubt, be aware that considerable delay would be incurred in obtaining plant at the present time, and it would take several months to obtain a retort unless you could pick up one second-hand.

Should you want full details of the canning of rabbits, we could recommend an expert who would give you the required information and also might be able to suggest some provisional methods which could be used while the proper plant is being made.

Adhesive for Labels

7,397. *I seem to remember some time back reading in your Journal recipes for adhesives which would successfully stick labels to tin and painted surfaces on containers. I shall be obliged if you will let me have these, either by post or given in your Journal, as I am rather up against such a problem at present.* (Winchmore Hill.)

The following formula was used very successfully on a large scale in one canning factory: Make a paste in the usual way with 15 parts of water and 3 parts of flour. Then make the following mixture: 1 part of resin dissolved in 4½ parts of methylated spirits. Mix this well with the flour paste. The paste is applied to the labels and allowed to get slightly tacky before putting on the tins, which should, of course, be free from grease.

There are, however, such excellent proprietary adhesives (names given) on the market that most packers do not trouble to make their own.

Information Supplied

7,209. *We should be obliged if you could advise us of the maker of "diacetyl", a flavour for adding to margarine.* (Letchworth.)

Names were given.

7,248. *Can you let us know a make of pure blood albumen?*

We understand that this product is very scarce, if not unobtainable. We have, however, given the names of possible suppliers.

7,252. *Please let us know the address of a manufacturer of lifting trucks.* (Eire.)

Address given.

7,273. *Please let us have sources of technical information regarding the manufacture of potato starch.* (Herts.)

You will find articles in recent numbers of FOOD MANUFACTURE which may be of help.

7,279. *I seek information on turnips and mangel-wurzels which were used in the last war in the making of jams and marmalade.* (London.)

Some suggestions were given.

7,283. *Would you please give us the names of manufacturers of glass-lined pans or glass pans?*

This was done.

7,292. *I am concerned with a liquid-proof closure for standard 2-lb. jam jars. I wish to use an adhesive to fasten this to the surface of the glass. I wonder whether you can recommend me to a firm in a position to supply a glue which becomes readily workable with the application of moderate heat but which is quite safe if accidentally brought into contact with food substances, particularly fruit acids or a solution containing sulphur dioxide.* (Kent.)

The name of a firm likely to help was given.

7,295. *We shall be obliged if you can put us in touch with any manufacturers of potato washing and slicing machinery.* (London.)

This was done.

7,296. *We should be much obliged if you would kindly send us the names of manufacturers of meat extract flavouring essences.* (Newcastle-upon-Tyne.)

Addresses supplied.

7,297. *Could soya bean flour be used as one of the ingredients of an egg substitute mixture?* (Eire.)

We understand that it is sometimes used for this purpose.

7,307. *We should be very much obliged if you would give us the name of a firm from whom we can obtain 28/56-lb. lots of soya bean meal.* (London.)

Names were given.

7,313. *Please could you give us the address of two potato flour factories in this country?* (Somerset.)

This was done.

7,320. *Will you please supply us with a list of firms who market vegetable extracts, both in powder and paste form?* (London.)

This was done.

7,322. *In an issue of* FOOD MANUFACTURE *of early this year or late the year before you made reference to a product which could be used as a glycerine substitute. Could you give us the name of the suppliers?* (Manchester.)

This was done.

7,324. *We are manufacturers of culinary essences for household use, and we obtain all our essential oil and concentrated essences locally, but as we are anxious to make synthetic essences such as lemon, orange, strawberry, raspberry, banana, rum, etc., we shall be very glad if you can give us any information with regard to the kind of plant that is necessary for this purpose.* (New Zealand.)

The name of an expert in this matter was sent to this enquirer.

7,331. *We should be very glad if you could furnish us with the names of manufacturers of pressure cookers for processing cereals for breakfast foods.*

Also, it would be very much appreciated if you could refer us to any books or journal articles on this subject. (Quebec.)

Names were given.

7,332. *Will you kindly obtain for us, if possible, names and addresses of firms able to supply rice gluten in batches of one ton or more?* (Ipswich.)

Names were given, but it was pointed out that supplies were doubtful.

RECENT PATENTS

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

A New or Improved Method of Preparing Meat for Transport

This invention relates to a method of packing meat especially for transport by shipment from one country to another. Its main object is to provide such a method as will enable very considerable economy to be effected in the stowage space required for bulk shipment of meat, such economy being of particular importance at the present time under war conditions when the question of providing sufficient vessels for the bulk shipping of meat from one country to another is an extremely important one.

Carcases of meat (which term is intended to include beef, mutton, lamb, pork and veal) are prepared for bulk shipment by being boned and pressed into a uniform size which is convenient for bulk shipping by packing in a vessel, the pressed flesh being frozen so as to retain its pressed shape. To effect boning, the carcase would be divided into sections to make suitable joints, and then the bone would be removed from the flesh as carefully as possible so as to leave the flesh free as far as possible from ragged or jagged cuts, the flesh being usually removed from between the bones so as to avoid wastage of meat. The flesh left after boning would be roughly folded to the required shape and pressed, preferably into an approximately rectangular or square block form, so that the individual pressed and frozen blocks of flesh can be stacked much in the manner of bricks.

While the minimum size of block cannot rigidly be defined, it may be pointed out that, for the purposes of the bulk shipping of meat (and this invention is concerned solely with such bulk shipment) for the wholesale meat trade, the minimum size would not be less than approximately one-half hundredweight, and would be made up of what is known in the meat trade as "cut parts"—*i.e.*, a block of boned meat would comprise, say, three whole fore-ribs or two whole sirloins or two whole rumps.

Such a method of preparing flesh for shipment in bulk enables very considerable economy to be effected in the stowage space required for any given quantity of meat, and so enables a reduction to be effected in the number of ships required.

It has before been proposed to prepare meat for the market by the method which consists in separating the meat from the carcase or carcases immediately after killing, and before *rigor mortis*, into a plurality of independent bone-freed portions and moulding the separated portions, while the meat is limp and still retains its animal heat, to any desired shape or form—*e.g.*, to standardised rectangular shape. The moulded meat is then chilled, the chill being carried nearly to the freezing point or thereabouts. This proposal thus relates to "chilled" meat as distinct from the present invention, which is concerned with frozen meat.

The flesh, having been boned, can be wrapped in a suitable cloth or other wrapping material, either before or after the flesh has been pressed and frozen.

The flesh can be pressed into and frozen in moulds to produce blocks of the required shape and size; the moulds may be formed by crates or boxes or other suitable receptacles in which it is intended to ship the flesh, but in other cases the flesh, after being pressed into and frozen in the moulds, can be removed therefrom for shipment. In the case in which the flesh is to be shipped in crates or boxes, the crates or boxes could themselves be placed in supports, which would operate to prevent the crates or boxes from bursting while the flesh is pressed into them.

The moulds or the crates or boxes could be lined with the wrapping material before flesh is placed in them, so that the wrapping material is in readiness to be wrapped around the flesh after it has been pressed and frozen.

In addition, it may be preferable in some cases to arrange that the blocks shall be formed of meat suitable for different purposes—*i.e.*, blocks could be formed, in some cases, of meat (*e.g.*, ribs and sirloins) suitable for roasting, and, in other cases, of meat suitable for boiling or stewing, the crates or cases for the meat being suitably marked.

It will be appreciated that with this method of preparing flesh in bulk for shipment according to the present invention a very much greater quantity of meat could be transported by any given vessel than with the more usual method of shipping meat.

When the meat is contained in cases marked to indicate the different kinds of meat, the work of supplying meat would be greatly facilitated.

While, as has been stated, the present invention is particularly beneficial in war-time circumstances, the invention could be employed in peace-time conditions, inasmuch as it would enable the cost of freightage and transport very considerably to be reduced.

537,867. Walter George Oxley.

Latest Patent Applications

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.

9391. Electrolux, Ltd.: Refrigerator cabinets.
9392. Continental Can Co., Inc.: Methods and apparatus for hermetically closing cans.
9470. Bottomley, F., and Roberts, T. F.: Manufacture of confectionery.
9610. Thomson, T.: Agricultural appliances.
9622. Briggs and Co., Ltd., and Waterfield, M.: Apparatus for heating liquids.
9671. Eddleston, T.: Agricultural machines.
9733. Co-operative Wholesale Society, Ltd., and Green, J. E.: Manufacture of margarine, etc.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at he uniform price of 1s. each.

538,888. Aktiebolaget Separator: Milking machine teat cups.
538,974. Flower, Sir N., Cribb, R. W. E., and Brooks, J. L.: Machines for applying crown corks to bottles, cans and the like.
539,015. Noble, I.: Cardboard boxes or containers.
539,056. Distillation Products, Inc.: Vacuum distillation.
539,147. Wade, W. J.: Cooking, lighting and heating unit.
539,151. Detroit Lubricator Co.: Refrigerating apparatus.

TRADE MARKS

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

ASHEX.—614,879. Cooking essences and flavourings (none being essential oils), custard powder, baking powder, cereals prepared for food, coffee and cocoa. **Ashe Laboratories, Ltd.,** 120-2, Victoria Street, Westminster, London, S.W. 1; Manufacturing Chemists.

MAID MARIAN.—615,050. Malt vinegar (for food). **Danish Bacon Co., Ltd.,** 9-13, Cowcross Street, London, E.C. 1; Wholesale Provision Merchants. (Associated.)

ESSEX GIRL.—615,070. Canned fruits, canned vegetables, canned meat, canned fish, canned poultry, canned game, canned milk and canned cream. **North Sea Canners (of Great Britain), Ltd.,** The Quay, Wivenhoe, Essex; Canners. (*It is a condition of registration that the Mark shall be used only in relation to goods canned in the County of Essex.*)

ALVAN.—615,163. Preserved meat and meat extracts. **Albert E. Evans and Co., Ltd.,** 144, Falkland Road, Harringay, London, N. 8; Meat Canners and Packers.

CREMALT.—612,761. Mixtures of flour and malt, the flour predominating, and cakes made therefrom. **Cremalt, Ltd.,** Albion Mills, Tat Bank Road, Oldbury, Worcestershire; Manufacturers.

CHARMOND.—613,628. Canned vegetables. **Mabel Olive Gould,** trading as **Charmond,** 66a, Eastbourne Road, Southport, Lancashire; Manufacturer and Merchant. (By Consent.)

NEW COMPANIES

British Federation of Wholesale Confectioners Limited. (365264.) 20, Alberta Avenue, Leeds, 7. Dirs.: J. T. May, 124, Stapleton Road, Bristol, 5; Arthur J. Bolton, 189, Evelyn Street, S.E. 8; John Kendall Taylor, 25, Easton Street, High Wycombe, and four others.

Harry H. Bunning Limited. (365121.) King's Walk, Wisbech, Cambs. To carry on bus. of potato, fruit and produce mchts., etc. Nom. cap.: £1,000 in £1 shs. Dirs.: H. H. Bunning, King's Walk, Wisbech (permt.); Mrs. C. J. Bunning, King's Walk, Wisbech.

Cheltine Foods, Limited. (366446.) Regd. April 9, 1941. Cheltine Works, Chester Walk, Cheltenham. To carry on the bus. of bakers, confectioners, provision mchts., etc. Nom. cap.: £2,000 in £1 shares. Dirs.: J. Bubb, 43, Clarence Street, Cheltenham; J. P. Holborow, Clenure House, Charlton Kings.

Davies Food Stores Limited. (365578.) 7, Southey Hill, Sheffield, 5. To carry on the bus. of grocers, etc. Nom. cap.: £500 in £1 shs. Dirs.: Mrs. L. M. Davies, 7, Southey Hill, Sheffield, 5; A. J. M. Prowse, 388, Southey Green Road, Sheffield, 5; V. J Jones, 14, Hatfield House Lane, Sheffield.

Eastcheap Commodities Limited. (365197.) 46, Queen's Gardens, Lancaster Gate, W. 2. To carry on the bus. of mnfrs. and importers of and dlrs. in foodstuffs, etc. Nom. cap.: £2,000 in 5s. shs. Dirs.: R. A. Snell, Whiteness Hotel, 45-47, Queen's Gardens, W. 2; T. Sontzos, 4, Wexford Court, Oldfield Road, Maidenhead; N. Tambakis, 62, Talbot Road, Bayswater, W. 2.

H. C. Hay and Co., Limited. (366095.) 16, Great Dover Street, S.E. 1. To carry on the bus. of provision and produce mchts. Nom. cap.: £20,000 in £1 shares. Dirs.: Not named. Subs.: H. J. Knight, Crofton, Warwick Road, Coulsdon, Surrey; R. H. Storey, 186, Nevill Road, Hove, Sussex.

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